PEST CONTROL

FOR THE HOME AND GARDEN

INSECTS • PLANT DISEASES • VERTEBRATES • WEEDS

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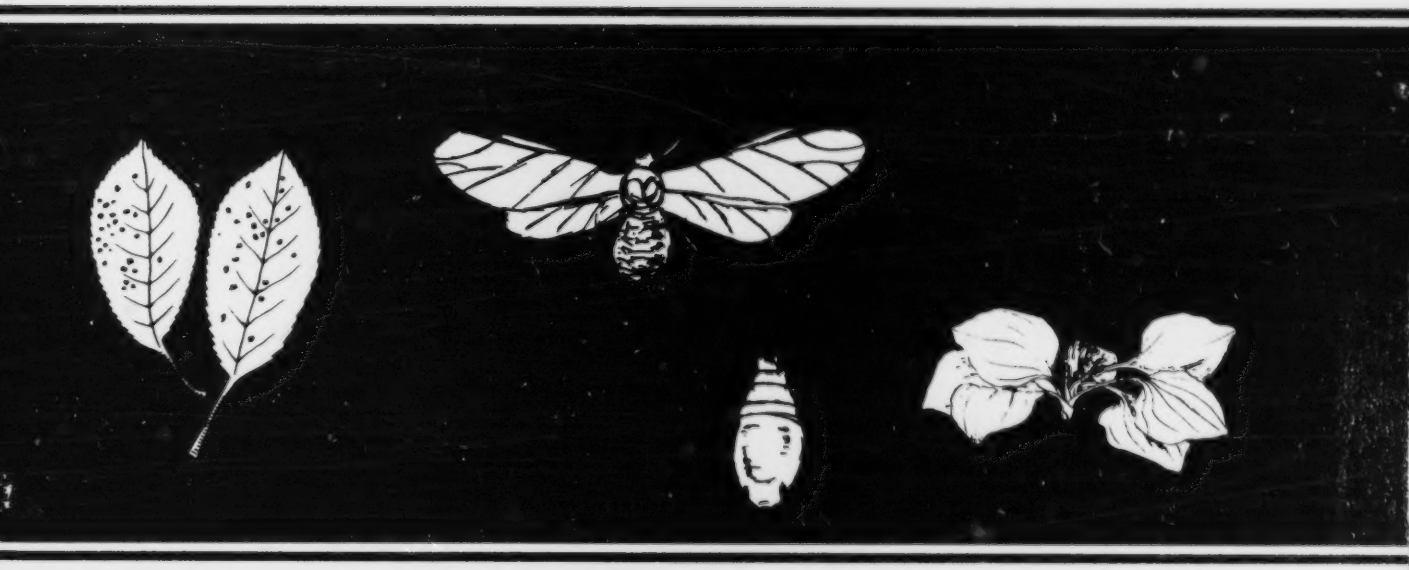

Province of British Columbia
Ministry of Agriculture & Food

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PEST CONTROL

for the

Home and Garden

Insects. Plant Diseases. Vertebrates. Weeds.

Province of British Columbia

Ministry of Agriculture and Food

Victoria, B.C.

Reprinted with corrections 1985

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INTRODUCTION

This publication is designed for home gardeners. It will help you identify home and garden pests and select safe and effective controls.

Many pests can be controlled by using good cultural practices. There are times, however, when pesticides are required. When using pesticides it is very important to follow all of the directions on the pesticide package label. To guard against pesticide residues on food crops be sure to read page 9 "Residues on Fruit and Vegetables".

For the convenience of home gardeners, brand names of pesticides are used in this publication. This does not constitute an endorsement of these products, nor a suggestion that like products are not effective. Only those pesticides with a DOMESTIC label may be used by home gardeners.

GENERAL INFORMATION

IMPORTANT FACTS

The following are important facts to keep in mind when dealing with garden problems:

- It is normal for garden plants to have some pest damage.
- Healthy plants can withstand pest attack better than plants growing under stress.
- Many garden problems are the result of poor growing conditions (wrong soil acidity, too much or too little water, fertilizer or sun).
- To be effective, pest controls must be applied at the proper developmental stage of the pest. Controls applied at the wrong time are useless.
- Some pests, for example root maggots, require preventive control measures long before the damage is evident.
- Many insects found in the garden are important pollinators, eat other insects and are harmless. Only a few species of insects found in the garden are pests.

These facts suggest the following:

- The time to start pest control is before the garden is even planted. Find out which plants will grow well in the garden. Read about the pest problems of those plants and carry out the cultural controls suggested in this booklet.
- Keep your plants healthy through proper growing practices.
- Keep a close watch on the garden for the first signs of a problem.
- Identify the problem before trying any controls. Using the wrong control, or even the correct one at the wrong time, is of little use. The unidentified insect you spray may actually be beneficial. A small magnifying glass (10x) is very useful in helping to identify problems.

IS PEST CONTROL REQUIRED?

The gardener must first decide if control measures are really necessary. A few scabs on an apple or some aphids on potato plants are not really serious. The damaged areas can be removed prior to use. It is not difficult to live with minor damage to our plants, but it does require a bit of getting used to.

CULTURAL METHODS OF PEST CONTROL

Cultural methods of pest control work by interfering with the pest at a susceptible period in its life cycle. For example, we know that most diseases of garden plants are caused by fungi or bacteria, that many of these fungi and bacteria are transmitted by splashing water and that they require moist conditions for survival in the initial stages of infection. Thus, important controls for these diseases are to water only the roots of the plants, and to grow them under conditions which permit rapid drying of the foliage.

Many plant diseases and insect pests in the home garden survive over the winter in plant refuse. Pest control begins with cleaning up plant refuse in the fall.

Removal of plant debris will help to delay the development of serious disease and insect problems in small gardens where crop rotation is not always feasible. Dispose or burn plant refuse rather than composting if garden pest problems have been serious. Be sure that composted material is completely decomposed before spreading it on the garden so as to prevent spreading pests. If the plant material has been properly composted, many pests will have been destroyed.

Crop rotation also helps to control pests. Plant the garden so that the same crop is not grown in the same spot year after year.

Cultural methods of controlling certain other pests are given in this booklet. They work, but they require a bit of planning. Think ahead!

USING CHEMICALS FOR CONTROLLING PESTS

There are times when non-chemical methods are not sufficient, and pesticides are required. But as a general practice, pesticides should only be used as a last resort. It is wrong to neglect non-chemical methods of pest control and rely solely on pesticides to solve pest problems.

When choosing pesticides, select only those recommended for your specific problem. These pesticides have been tested and shown to be safe **when used as directed**. Under no circumstances should you apply a pesticide in the hopes of curing an unknown problem. Before using any pesticide, read pages 8–11.

PEST IDENTIFICATION

Identification of pest problems is necessary in order to select proper controls. Most pest problems you will encounter can be identified through the pictures and descriptions in this publication. A magnifying glass is very useful in making identifications.

It is a good idea to keep a record of all gardening activities. There is room for you to make your notes right in this book. You will find your records very helpful in diagnosing problems.

If you come across a problem you cannot identify, samples of the problem may be sent to the nearest district office of the British Columbia Ministry of Agriculture and Food.

Remember, even an expert cannot identify a squashed insect or find out what is wrong with a shrivelled-up leaf. It is very important that any specimens, submitted for identification, be fresh and in good condition. Equally important is an accurate description of the problem and all related details.

Most insects submitted for identification can be sent in live or dried. The following are exceptions:

- press butterflies and moths between stiff pieces of paper or place them carefully in an envelope;
- send caterpillars and other fleshy-bodied insects with their natural food or preserved in alcohol.

When submitting insects, include a brief description of where they were found, the extent of infestation and the type of damage done. Send more than one specimen.

Samples of diseased plants submitted for diagnosis must include representative samples of both diseased and healthy portions of the plants. The following procedures should be followed:

Leaves—Press leaves flat between several sheets of paper towelling, then place between pieces of cardboard and put into a plastic bag. Do not moisten the paper or plant.

Fruit—Send fresh fruit showing symptoms. Do not send fruit in advanced stages of decay. Wrap each piece of fruit in a paper towel, place in a plastic bag and mail in a sturdy box. Do not moisten the fruit.

Roots, stems or entire plant—Wash the soil away from the roots, towel dry and enclose in a plastic bag. Wrap whole plants in newspaper so that the roots do not contact the rest of the plant. Mail in a cardboard box. Do not moisten the plants.

Enclose a letter with the diseased specimens giving the variety of the plant, a description of the disease, soil conditions and weather conditions within the last few weeks. Also list the dates when any fertilizer or pesticide was applied and the rates of application.

The importance of fresh, representative samples and complete, accurate information cannot be over-emphasized. Without these things, your problem may remain unsolved.

SOIL MANAGEMENT IN THE HOME GARDEN

A soil suitable for growing healthy plants must meet two basic conditions:

(1) All the nutrients essential for growth must be available in sufficient quantities.

(2) The soil must be in good physical condition or tilth to permit adequate aeration, retention of water and nutrients and good root penetration and development.

To maintain soil fertility and tilth, three major amendments should be made regularly—organic matter, lime and fertilizer.

Organic Matter

Organic matter is added to soil to improve its physical condition and, to a lesser degree, to supply nutrients. Organic matter breaks down in the soil to form humus which improves the aeration of a soil high in clay and makes it easier to work. Humus also improves the water and nutrient-holding capacity of sandy soils. Organic matter of some form should be applied regularly to gardens, ornamental and flower beds and lawns.

Organic materials suitable for the garden include manures, composts, peat moss, seaweed and many others. Manures and composts are among the best materials because they are usually rich in nutrients and less additional fertilizer is required. Peat moss is useful as a soil conditioner but supplies almost no nutrients to the soil.

Compost is one form of organic matter available to all gardeners at a minimal cost. Compost is a soft, crumbly, dark substance resulting from the thorough decay of vegetative refuse. It is made by piling up layers of kitchen refuse (uncooked only), grass clippings, leaves, crop residue and other vegetative matter. Large, coarse pieces should be chopped up before being added to the pile. A few shovelfuls of soil and a sprinkling of lime and a nitrogenous fertilizer between each layer will speed up the decomposition process. The material should be moist but not waterlogged. If the pile is built inside a bin or box, heat will be retained resulting in quicker breakdown. The bin should have holes or gaps in the side or bottom to allow for aeration.

The heap should be turned every few weeks (or more often) to introduce air into the pile and to redistribute material in various stages of decomposition. The ideal bin will have three receptacles—one for incoming material, one for working material and one for the finished product. The mature compost can be screened for lawn and garden use. Non-decomposed, coarse pieces can go back to the pile for further breaking down.

Lime

Some soils, particularly those on the coast, are subject to leaching, resulting in acid or sour soil restrictive to plant growth. Lime is applied to neutralize soil acidity and to a lesser degree supply calcium. If dolomitic lime is used, magnesium will also be supplied.

The need for lime in a soil is best determined by a soil test (contact any B.C.M.A.F. office for soil test information). For most coastal soils an application of lime every few years will keep the soil at a pH suitable for plant growth.

In the vegetable garden, finely ground limestone should be applied every two or three years at the rate of 25 kg/100 m^2 and incorporated while digging or rotovating. This can be done in the fall or early spring at least a month before planting. Lime should not be applied where potatoes are to be grown as it promotes scab.

For lawns, apply 50 kg/100 m^2 of ground limestone and incorporate it into the top 15 cm before seeding. Thereafter, apply 12–25 kg/100 m^2 to the lawn surface every two to three years.

In flower beds and ornamental borders, apply 25–50 kg/100 m^2 of ground limestone and incorporate before planting. After initial establishment, lime should be applied every few years at 12–25 kg/100 m^2. Lime should not be applied to acid-loving plants such as camelias, rhododendrons, azaleas and blueberries.

Fertilizer

Soils must supply many elements for plants to grow properly. If any one essential element is deficient, plant growth will suffer. Elements required in the largest quantities and often found deficient in the soil are nitrogen, phosphorus and potassium. These nutrients usually have to be added to the soil in some form each year.

Manures and composts are fairly high in these nutrients and, if large enough quantities are available (1–3 m^3/100 m^2), no other fertilizer will be required except possibly an application of superphosphate or bone meal to supply additional phosphorus. As large quantities of manure are not available to most gardeners, the best fertilizer program is to use whatever organic material is available and supplement this with commercially prepared fertilizers.

Commercial fertilizers are of two types—derived from organic materials or chemically synthesized. The chemical fertilizers are cheap and readily available to roots in the soil. The organically derived materials are more expensive and nutrients are more slowly released.

On all fertilizer bags or boxes are three numbers which indicate the percentage by weight of nitrogen, phosphate and potash in the material.

Example:

4-10-10	4% nitrogen, 10% phosphate, 10% potash
6- 8- 6	6% nitrogen, 8% phosphate, 6% potash
34- 0- 0	34% nitrogen, 0% phosphate, 0% potash

Different fertilizers contain different quantities of plant nutrients. When determining application rates, this must be taken into account. For example, 10 kg of 34-0-0 contains as much nitrogen as 57 kg of 6-8-6.

Generally, fertilizers relatively high in nitrogen are used for leafy vegetables, lawns, young trees and shrubs. Fertilizers relatively high in phosphorus and potassium are preferred when growing plants for flower, fruit or root production.

The fertilizer requirements of soil are best determined by a soil test (contact any B.C.M.A.F. office for soil test information). The following rates are recommended as a general guideline. Other fertilizers of similar ratios can be substituted for the ones listed here. Higher analysis fertilizers can be substituted at lower rates, e.g. instead of using 15 kg of 4-10-10, use 7 kg of 8-24-24. Do not use excessive rates or crop damage in the form of fertilizer burn may result. If manures or composts are used apply lower rates of fertilizer.

Vegetables

Broadcast one of the following fertilizers over the garden and incorporate into the surface 7–10 cm.

Fertilizer	Rate kg/100 m²
4-10-10	12–15
6-8-6	12–15

For leafy vegetables and corn, apply a side dressing of one of the following nitrogenous fertilizers after the plants are well established.

Fertilizer	Rate kg/100 m²
21-0-0	3–4
34-0-0	1.5–2

Place fertilizer in a furrow to one side of the plant row. Do not place fertilizer in direct contact with plants. Water afterwards to wash the fertilizer into the root zone. If the soil is high in organic matter, or manure or compost was applied, side dressing is not necessary.

Lawns

Prior to seeding a new lawn, apply one of the following fertilizers and incorporate into the top several centimetres of the soil.

Fertilizer	Rate kg/100 m²
13-16-10	7.5
8-10-6	12.5

Once established, the lawn will require periodic fertilizer applications to maintain vigour. Apply one of the above fertilizers at half rate or a dressing of well rotted manure or compost in the spring and fall.

Some lawns, particularly those on soil low in organic matter, will require two or three additional applications of nitrogen during the season.

Example:

34-0-0 at 1 kg/100 m².

Broadcast fertilizer evenly over the lawn and water afterwards to wash fertilizer into the root zone and prevent burning the grass.

Flower Beds and Ornamental Borders

For annual or newly established perennial flower beds, apply a complete fertilizer such as 4-10-10 at 12–15 kg/100 m² and incorporate into the top several centimetres of the soil before planting.

For trees and shrubs apply a complete fertilizer high in nitrogen, such as 9-5-7 or 12-4-8, four to six weeks after planting. An annual spring application thereafter will be sufficient to maintain vigour. Fertilizer should be broadcast over the area extending from the trunk to slightly beyond the spread of the branches. As a rule of thumb use about 200 g of 9-5-7 for each centimetre of trunk diameter.

Micronutrients

In addition to nitrogen, phosphorus and potassium, plants require small amounts of other elements including calcium, magnesium, sulfur, iron, manganese, boron, copper, zinc and molybdenum. Where manures or other organic materials are applied regularly, deficiencies of these nutrients rarely occur.

Where limited manure is available, or under certain soil, cropping and climatic conditions, specific minor element deficiencies may occur. Frequently observed minor element deficiencies include: zinc in tree fruits (Okanagan), boron in tree fruits and vegetables (Interior and Coast), magnesium in coniferous evergreens (Coast) and iron in broadleaved evergreens and bush fruits (alkaline Interior soils).

Minor element deficiencies can be corrected by the use of appropriate soil amendments or through foliar applications of minor element solutions. In the home garden, a reliable diagnosis or soil test should be carried out prior to beginning a corrective program.

Boron is often deficient in B.C., particularly in coastal regions and sandy Interior soils. Boron deficiency symptoms include brown curd in cauliflower, hollow stem in cole crops, cracked stem of celery, bitterpit in apples and cankers on beets. The following table indicates the boron requirements of different vegetables. The vegetables in the high requirement category may require annual applications of boron in coastal regions. In the Interior, boron requirements are

similar but the danger of carryover, damaging sensitive crops such as cucumbers, is somewhat greater due to less leaching of the soil over the winter. Boron may be applied by dissolving borax (11% boron) in water and sprinkling the solution evenly over the soil surface.

Boron Requirements:

CAUTION: DO NOT EXCEED THESE RATES AS BORON MAY CAUSE PLANT INJURY.

(borax—11% boron)

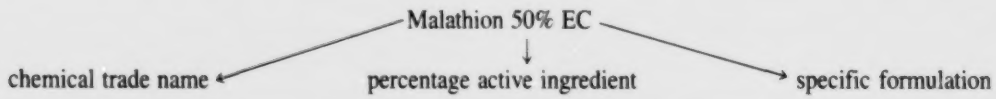
mL/9 m²	Crop Group
0	Beans, cucumbers;
15	Canteloupe, melons, parsley, peas, potatoes, pumpkins, squash;
30	Asparagus, broad beans, carrots, celery, corn, eggplant, lettuce, onions, peppers, radish;
45	Tomatoes;
60	Beets, broccoli, brussels sprouts, cabbage, cauliflower, Chinese cabbage, kohlrabi, rutabaga, turnip.

Fritted-trace-elements (F-T-E), containing boron, copper, iron, manganese, molybdenum and zinc carried on glass beads, can be purchased for houseplants and garden plantings. Only use F-T-E at the recommended rates on the label and mix thoroughly into the soil. Magnesium can be applied by using dolomitic lime or Epsom salts.

ABBREVIATIONS USED IN THE TEXT

m = metre
cm = centimetre
mm = millimetre
L = litre
mL = millilitre
kg = kilogram
g = gram

D = dust
E = emulsion
EC = emulsifiable concentrate
G = granular
sol = solution
SU = suspension
WP = wettable powder
p.p.m. = parts per million by weight
RTU = ready to use formulation



USEFUL MEASUREMENTS

The home gardener should purchase a set of metric measuring spoons (1, 2, 5, 15 and 25 mL sizes) for proper pesticide measurement. Metric weight scales, sensitive in the 1–100 gram range, are useful for weighing dry pesticide formulations. If you wish to convert grams into ounces divide the number of grams by 28.

Metric

10 mm = 1 cm
100 cm = 1 m
10 000 cm^2 = 1 m^2
10 000 m^2 = 1 hectare

1 000 mL = 1L
1 000 g = 1 kg

1 mL = 1 g
1 L = 1 kg
} for water at 4°C

U.S.

1 U.S. gal. = 0.8345 (approximately ⅚) of an Imperial gallon
1 U.S. pt. = 16 U.S. fl. oz.
1 U.S. gal. = 128 U.S. fl. oz.

Proportions

1 tsp./gal. = 1 mL or g/L
1 tbsp./gal. = 3 mL or g/L
1 cup/gal. = 50 mL or g/L

1 imperial gallon = 4 quarts = 8 pints = 160 fluid ounces
= 10 pounds of water
= approximately 1.2 U.S. gallons
1 U.S. gallon = .8345 or approximately ⅚ imperial gallon
1 imperial quart = 2 pints = 40 fluid ounces
= 5 household cups
1 imperial pint = 20 fluid ounces = 2½ household cups
1 fluid ounce = 2 level tablespoonfuls

1 tablespoonful = 3 level teaspoonfuls
1 pound = 16 ounces
1 rod = 16.5 feet = 5.5 yards
1 yard = 3 feet = 36 inches
1 foot = 12 inches
1 acre = 43,560 square feet = 4,840 square yards = 160 square rods
1 square yard = 9 square feet
1 square foot = 144 square inches

METRIC EQUIVALENTS

Length

inch	= 2.54 cm	millimetre	= 0.039 in.
foot	= 0.3048 m	centimetre	= 0.394 in.
yard	= 0.914 m	decimetre	= 3.937 in.
mile	= 1.609 km	metre	= 3.28 ft.
		kilometre	= 0.621 mile

Volume (liquid)

teaspoonful	= 4.735 mL	millilitre	= 0.035 fl. oz.
tablespoonful	= 14.206 mL	litre	= 35.2 fl. oz.
fluid ounce (Imp.)	= 28.412 mL	hectolitre	= 26.418 gal. (Imp.)
pint (Imp.)	= 0.568 litre		
gallon (Imp.)	= 4.546 litres		

Area

square inch	= 6.452 cm^2	cm^2	= 0.155 sq. in.
square foot	= 0.093 m^2	m^2	= 1.196 sq. yd.
square yard	= 0.836 m^2	km^2	= 0.386 sq. mile
square mile	= 2.59 km^2	ha	= 2.471 acres
acre	= 0.405 ha		

Weight

ounce	= 28.349 g	gram	= 0.035 oz. (avdp)
pound	= 453.592 g	kilogram	= 2.205 lb. (avdp)
hundredweight (Imp.)	= 45.359 kg	tonne	= 1.102 short ton
ton	= 0.907 tonne		

Volume (dry)

cubic inch	= 16.387 cm^3	cm^3	= 0.061 cu. in.
cubic foot	= 0.028 m^3	m^3	= 31.338 cu. ft.
cubic yard	= 0.765 m^3	hectolitre	= 2.8 bu.
bushel	= 36.368 litres	m^3	= 1.308 cu. yd.
board foot	= 0.0024 m^3		

Proportion

1 gal./acre	= 11.232 litres/ha	1 litre/ha	= 14.24 fl. oz./acre
1 lb./acre	= 1.120 kg/ha	1 kg/ha	= 14.5 avdp oz./acre
1 lb./sq. in.	= 0.0702 kg/cm^2	1 kg/cm^2	= 14.227 lb./sq. in.
1 bu./acre	= 0.898 hL/ha	1 hL/ha	= 1.112 bu./acre

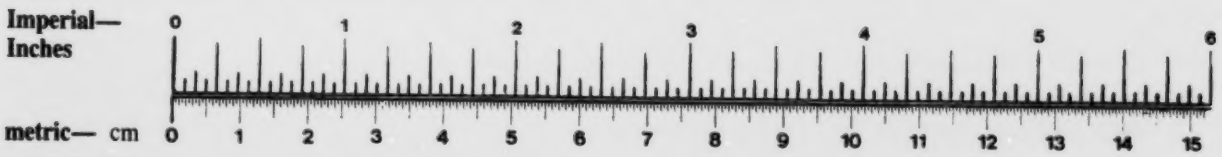
Temperature

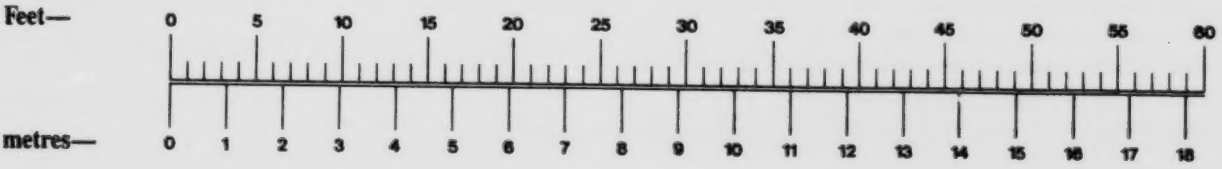
Celsius	−20°	−15°	−10°	−5°	0°	5°	10°	15°	20°	25°	30°	35°	40°
Fahrenheit	−4°	5°	14°	23°	32°	41°	50°	59°	68°	77°	86°	95°	104°

CONVERSION FACTORS

Imperial Units		Metric Units
inches	× 2.5	= centimetres
feet	× 30	= centimetres
feet	× 0.3	= metres
fluid ounces	× 28	= millilitres
pints	× 0.57	= litres
quarts	× 1.1	= litres
gallons	× 4.5	= litres

Imperial Units		Metric Units
ounces	× 28	= grams
pounds	× 0.45	= kilograms
square inches	× 6.5	= square metres
square feet	× 0.09	= square metres





PESTICIDES

Pesticides are just one method of controlling pests and should be used only when necessary and when non-chemical methods are ineffective. Remember pesticides are poisons and should be treated as poisons.

Pesticides are chemicals used to control fungi, bacteria, insects, and weeds. The various pesticides are classified accordingly as fungicides, bactericides, insecticides, or herbicides.

Millions of dollars are spent on pesticide research. The research data are reviewed by experts of various government bodies including Health and Welfare Canada and Agriculture Canada. After long and extensive investigation a decision is made with regard to registering the product for use in Canada. If registered, the product is given a Pesticide Control Product (PCP) number that must appear on the label. The product can then be used in Canada according to the label directions. As a result of this research and legislation, the pesticide label, prepared by the manufacturer, is a reliable document prescribing the proper useage of the pesticide. Harmful effects to man and the environment are created by the careless use of pesticides.

Only those pesticides which include the word DOMESTIC on the label are for home and garden use. Very toxic (poisonous) chemicals are not sold under a DOMESTIC label. The toxicity of each product depends on the active ingredient, its concentration, and diluents.

It is the RESPONSIBILITY OF THE USER to handle, store, and apply pesticides correctly and safely. READ THE LABEL AND FOLLOW LABEL DIRECTIONS.

PESTICIDE SAFETY CODE

1. Buy and use only a pesticide with a DOMESTIC LABEL. Do not use a product marked AGRICULTURAL, COMMERCIAL, INDUSTRIAL, or RESTRICTED.
2. Use only the pesticide recommended for the problem.
3. Before opening the container, READ THE LABEL. Read it all, even the small print.
4. Follow the label directions and measure the dosage exactly. Do not use a little extra for good measure as too much may cause injury to plants, kill beneficial insects, and leave harmful residues on edible crops. Rates lower than recommended may result in unsatisfactory pest control.
5. Use a special measuring container for pesticides; do not use kitchen utensils.
6. Do not leave pesticide containers open or unguarded while spraying.
7. Do not apply pesticides on a windy day.
8. Spraying fruit and vegetable crops with insecticides when they are in bloom can reduce pollination and yield by killing bees that pollinate the flowers.
9. Never smoke, eat, or drink while applying pesticides.
10. Cover feed and water containers when treating around livestock or pets. Do not contaminate fish ponds or waterways.
11. Take care that poison baits do not accidentally poison children or pets.
12. Avoid inhaling sprays or dusts. Always wear protective clothing and masks when the label calls for them.
13. Wash your hands and face after applying pesticides.
14. If dusts or sprays are spilled on skin or clothing, remove clothing immediately and wash contaminated skin with warm, soapy water. Clothing must be thoroughly cleaned before it is re-used.
15. After applying pesticides, clean the equipment thoroughly. Clean and store your clothing and protective equipment.
16. Observe the required waiting period before harvest (see inside back cover).
17. Store pesticides safely (see page 9).
18. Dispose of unwanted pesticide containers safely (see page 9).

PESTICIDE VENDORS

Stores selling pesticides in British Columbia (except for those carrying products listed in Schedule V) are licensed by the Provincial Government as pesticide dealers. The sales personnel in these stores have been examined and certified on their knowledge of these chemicals. They are familiar with the pests of the area and are supplied with the latest control recommendations. Their experience and advice on pesticides and other aspects of gardening, will benefit any customer who consults them.

POISON SYMBOLS

Poison symbols on the label indicate the toxicity of the product. One or more of the following symbols can be on a label:

DANGER

POISON

WARNING

POISON

CAUTION

POISON

WARNING

FLAMMABLE

DANGER

EXTREMELY FLAMMABLE

CAUTION

FLAMMABLE

DANGER

CORROSIVE

WARNING

CORROSIVE

CAUTION

CORROSIVE

CAUTION

EXPLOSIVE

PESTICIDE STORAGE

1. Keep pesticides out of reach of children and pets. Store them in a locked cupboard away from food, medicine and feed.
2. Store volatile herbicides, such as 2,4-D and mecoprop, separately from other pesticides.
3. Always store pesticides in their original containers. Keep the containers tightly closed.
4. Always store pesticides where they are protected from freezing or excessive heat.
5. Dispose of pesticides which are no longer required. Dispose of containers which are unmarked, corroded or damaged.

DISPOSAL OF UNWANTED PESTICIDES

Disposal of unwanted pesticides is a critical problem. The best precaution against disposal problems is good planning—purchase only small quantities that you can use up.

To dispose of unwanted chemicals, especially those that are no longer recommended, contact the Pesticide Control Branch, B.C. Ministry of Environment or a B.C. Ministry of Agriculture and Food office.

Do not pour pesticides down the drain!

DISPOSAL OF PESTICIDE CONTAINERS

Destroy or dispose of empty containers immediately. Do not leave empty containers scattered around and never re-use pesticide containers.

After paper containers are completely empty, they should be disposed of in an outdoor garbage can or burned, unless the label cautions you not to do so.

Rinse out glass, plastic or metal containers with water before you finish filling the sprayer and add the rinse water to the sprayer. Break, puncture or crush the container before disposing of it in your outdoor garbage can.

RESIDUES ON FRUIT AND VEGETABLES

Pesticide residues are often the result of chemicals used at a rate exceeding the recommended dosage. The days before harvest on the back cover are based on the correct dosage, so adding a small amount extra "for good measure" increases the risk of dangerous residues being left on food crops. Especially where low dosages are prescribed, a small amount extra can increase the dosage by two or three times.

Pesticide residues can be avoided if:

(1) pesticides are used only when needed;
(2) only recommended dosages are applied to the plants;
(3) the waiting period between the last pesticide application and harvest is observed;
(4) fruits and vegetables are thoroughly washed before eaten;
(5) outside leaves of crops such as cabbage and lettuce are discarded.

SYMPTOMS OF PESTICIDE POISONING

Read the label for symptoms of poisoning. The symptoms of pesticide poisoning vary from person to person and are often difficult to recognize. If any illness or abnormal condition occurs during or after exposure to pesticides, see a doctor immediately and provide him with label information.

FIRST AID

Call your doctor or local Poison Control Centre immediately if there has been a suspected poisoning. The label has detailed first aid information. Give the label information to the doctor.

> WARNING
> Do not induce vomiting if a corrosive (acid or alkali) or petroleum product is accidentally swallowed.

POISON CONTROL CENTRES

Poison Control Centres are staffed 24 hours a day to provide first aid information and treatment of poisoning for many toxic chemicals.

The telephone numbers of the Poison Control Centres are listed on the inside front cover of the telephone directory under "Emergencies Only".

PESTICIDE FORMULATIONS

Most pesticides are available as dusts (D), emulsions (E), liquid emulsifiable concentrates (EC), granules (G), suspensions (SU), and wettable powders (WP). Each formulation has advantages and disadvantages.

Dust formulations consist of a low percentage of active ingredient in an inert powder. They are convenient where a small number of plants need to be treated, as they can be applied without special equipment and without mixing. Large plantings are easier to cover with sprays. Dusts present a drift problem and therefore must only be used in calm weather, usually in the evening or early morning. There is less danger of chemical burn to plants with dusts than with sprays, but they may leave an objectionable, visible residue on foliage.

Emulsion formulations consist of a combination of two or more liquids that will not mix, such as oil and water. One liquid is suspended or dispersed in the other in the form of minute droplets. Emulsions are prepared from emulsifiable concentrates by the addition of water, and are normally sold ready to use with no dilution, e.g., dog shampoo containing pyrethrin.

Emulsifiable or **liquid concentrates** consist of the active ingredient, a solvent and an emulsifier. The emulsifier is required to make the technical material mix smoothly with water to form an emulsion, e.g., Diazinon 12.5% EC. Emulsifiable concentrates are comparatively easy to measure and mix readily with water. This preparatory mixing and diluting is the main disadvantage, especially if several types must be prepared. The mixed spray will drift less than dust, but must only be used in calm weather. The oils in this formulation may burn the foliage of susceptible plants.

CAUTION: EC formulations may dissolve some kinds of plastics. Use glass or metal measuring devices.

Granules consist of a low percentage of active ingredient on inert particles. Like dusts, they are convenient to use on small plantings, not requiring special equipment or mixing. Granules do not present the drift problems common with dust formulations. They are mostly used to apply insecticides to soil for control of root pests, and are not for use on plant foliage.

Suspensions are similar to emulsions. They consist of finely divided solids suspended in a liquid, and are often called flowables or sprayables. Suspensions are designed to reduce or do away with solvents which are often toxic to plants but necessary in emulsifiable concentrates.

Wettable powder formulations consist of an active ingredient mixed with a suitable inert material such as talc or clay. When mixed with water they form a suspension. Unfortunately, wettable powders are difficult to measure accurately because of their dust-like form. Sprays containing a wettable powder require constant agitation to prevent settling. Although they contain no oils to burn foliage, they sometimes leave an unsightly residue on plants.

PESTICIDE AND FERTILIZER MIXTURES

Some products that are specially prepared for domestic use contain a mixture of pesticides and fertilizers, or a mixture of several pesticides. These products, intended to simplify pest control for the gardener, often result in unnecessary overuse of chemicals. Most insect and disease problems do not occur together and require separate treatments. Use of insecticide-fungicide formulations often leads to a waste or an overuse of either the insecticide or fungicide.

Home gardeners should bear in mind that the days before harvest recommended on the back cover are calculated on the use of the one chemical prescribed. **When using pesticide mixtures, follow label directions for days before harvest**.

USE AND MAINTENANCE OF EQUIPMENT

The purpose of dusters and sprayers is to distribute the pesticide on the affected plants. Thorough and even coverage with pesticides is essential; poor control is often the result of improper or poor coverage.

The kind of pesticide application equipment required by the home gardener depends on the type and size of garden (see table page 12). For a few low-growing vegetables and ornamentals, simple dusters or dusts in shaker packages are satisfactory. For fruit-trees and large plantings, a compressed air or knapsack sprayer will be required. Dosage with these sprayers can be closely controlled. Their range can be extended to cover tall trees by adding sections to the sprayer wand or by using ladders. Trees over 7.5 m will usually require a high pressure power sprayer for thorough coverage. Since power equipment is expensive, it is usually most economical to hire a commercial pest control firm.

Garden hose sprayer attachments are not recommended because the dosages they supply are variable and difficult to regulate. If there is no other alternative see page 14 (or see below) for details on calibrating a hose-end sprayer.

Do not use garden sprayers in the house. If pesticides are to be used indoors, apply them with a small hand sprayer or paint brush.

It is best to have one sprayer for herbicides and another for insecticides and fungicides. If this is not possible and only one sprayer is available, clean the hose and tank very carefully to ensure that all traces of herbicide are removed. After rinsing, add 1 mL of household ammonia or baking soda per litre of detergent solution, and let this mixture stand overnight in both the tank and hose. The next day, empty the sprayer by spraying the solution out through the nozzle, and rinse the tanks with clean water.

If sprayers are properly maintained, they can give many years of service. Some pesticides are corrosive to metal parts, so it is important to rinse and wash out the tank with detergent or soap solution after each use. Leave the tank uncapped and up-ended during storage to allow it to dry without rusting.

Worn shut-off valves and leaky hoses or joints should be replaced immediately. Faulty sprayers increase the hazard to the applicator and give poor results.

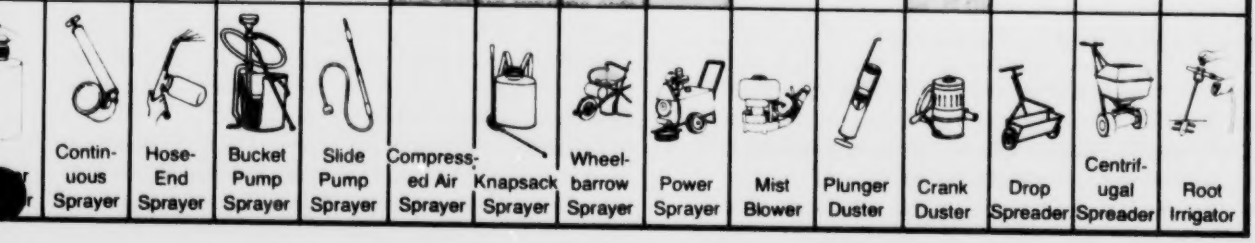
In the left-hand column, select the outdoor housekeeping task pertinent to your interest. Filled squares at the right indicate types of applicators suggested for that use.

Consider all your various jobs to find the type of equipment that will do a wide range of work for you.

Source: *A Guide to Safe Pest Control around the Home*, Cornell Misc. Bull. no. 74, pp. 14–15, 1979. NYS College of Agr. and Life Sciences, Ithaca, NY. Reprinted with permission.

Lawn Weeds		Small lots		
		Large lots		
Houseplants				
House Interior		Fliers		
		Crawlers		
Lawn Insects & Diseases		Small		
		Large		
Shrubs & Evergreens		24 or less		
		25–50		
		50 or more		
Gardens Flowers & Vegetables		500 sq ft		
		500–1000		
		Over 1000		
Trees & Fruit Trees		1–5		
		Over 5		
Outdoor Comfort	SMALL LOTS	Mosquitoes		
		Flies Wasps		
		House Invaders		
	LARGE LOTS	Mosquitoes		
		Flies		
		House Invaders		
			Shaker Can	Pressure Ca

Select Equipment for Your Gardening Needs



SPRAYER CALIBRATION

Reasons for Calibrating a Sprayer:

1. Pesticides are registered at a given amount per area, or per volume, e.g., 1 kg/ha, 1 L/ha, 10 g/100 m^2, 10 mL/100 m^2, or 5 ml/L.
2. Pesticides applied at the recommended rate will take a certain number of days to break down into harmless residues.
3. The number of days required between last application and harvest (see table on inside back cover) is reasonable assurance that the food is safe for consumption.
4. If an overdose is applied, the waiting period is prolonged although not necessarily in proportion to the amount of the overdose.
5. Pesticides can damage or kill plants if applied in excess of the recommended rate.
6. Applying less than the recommended rate, or at intervals other than those on the label, may result in unsatisfactory control. Treatment times and intervals are usually based on the life cycle of a pest, or on the residual activity of the pesticide.

How to Calibrate a Hose-End Sprayer:

Hose-end sprayers are not recommended for the application of pesticides because most do not give an accurate dosage and few can be used to apply wettable powders. If you want to use a hose-end sprayer, follow these steps to improve its effectiveness:

- Before connecting the hose-end sprayer be sure it is in good working order and the siphoning tube, nozzle and filter screens are clean.
- To help maintain a more constant water pressure while spraying avoid running the water from other taps on the premises.
- Open the tap fully while spraying with a hose-end sprayer.
- After use, flush both the sprayer and the garden hose with water.

If the sprayer has an instruction sheet on calibration use those instructions, otherwise follow these steps:

A. *Spraying an area on the ground*

1. Connect the garden hose to the water tap and hose-end sprayer.
2. Adjust the spray nozzle to the desired setting (narrow stream, fan shaped, or mist).
3. Fill the hose-end sprayer bottle with water (ink or food color may be added to make it easier to see the amount of water in the bottle).
4. Mark off an area 10 m × 10 m (= 100 m^2) using a measuring tape, stakes, and string.
5. Now turn the tap on fully (remember to do this every time thereafter to keep the calibration valid).
6. Walk back and forth over the marked-off area, spraying until the area is covered. (You may either time yourself, or remember the pace at which you walked, and do it at the same rate thereafter.)
7. Turn the water tap off and read the amount of liquid left in the sprayer bottle. The difference between this reading and the full mark is the amount of coloured water (pesticide) used.
8. If the pesticide container label indicated to use 10 mL/100 m^2, and you used 10 mL, then you used the right amount. If you were out one way or the other, adjust the application rate accordingly by walking faster or slower while spraying.
9. Empty the coloured water from the spray bottle and refill it with the required amount of pesticide and water to treat the infested area.
10. Turn the water tap on fully and spray the infested area.
11. Thoroughly rinse the sprayer and hose with water before storing it.

B. *Spraying trees and shrubs*

Fill the sprayer bottle according to the manufacturer's instructions. Where the instructions tell you to use a pesticide concentrate replace that amount with coloured water. Measure all liquids that go into the sprayer bottle and calculate the percentage of coloured water in the total volume of liquids in the sprayer bottle.

Connect the hose-end sprayer with the spray deflector removed (if possible), to a garden hose. Spray into a pail marked at 1 litre intervals and fill the pail to the 2 litre mark. Turn off the water.

Measure the amount of coloured water (pesticide) left in the sprayer bottle and divide by 2 to determine the amount used per litre of spray in the pail. Multiply this amount by the percentage of coloured water in the bottle. This is how much coloured water (pesticide) was used in 1 litre of spray. Compare this with the recommended dosage of pesticide on the label. If you have used more pesticide than recommended you will have to dilute the mixture in the sprayer bottle. If you have used less pesticide than recommended you will have to increase the concentration of pesticide in the sprayer bottle. Further information on calibrating hose-end sprayers is available at B.C.M.A.F. offices.

How to Calibrate a Pressure Sprayer:

Always use a funnel with a very fine screen to filter both the pesticide and the water to prevent debris from getting into the sprayer and clogging the nozzle.

1. Mark off a 10 m × 10 m (= 100 m^2) area with a measuring tape, pegs, and string.
2. Measure 4 L of water into the sprayer. (A 1 Imperial gallon sprayer holds 4.5 L, an American gallon holds 3.8 L).
3. Pump air into the sprayer. (The higher the air pressure inside the tank, the faster the spray will be discharged.)
4. Adjust the nozzle to desired pattern. (For weeds, a nozzle with a flat spray pattern is used. For insects and diseases, use a nozzle that delivers a hollow cone spray pattern.)
5. Use high pressure to spray for insects and diseases, low pressure for weeds.
6. Spray the measured area by walking over it and moving the wand slowly from side to side about 30 cm above ground level.
7. When the area is sprayed, release the pressure by slowly unscrewing the sprayer lid. Let's assume that all the water was just used up. Now you know that, if you maintain that pressure and walking pace, it takes 4 L to spray 100 m^2.
8. If the label instructs you to use 5 ml of pesticide/L of water, and to use 4 L of mixed spray/100m^2, then you would add 20 mL of pesticide to the 4 L of water and spray it on 100 m^2.
9. If you are spraying an upright plant, shrub, or tree, use the label amount of pesticide per given volume of water and apply enough spray to wet the foliage.
10. When the label specifies spraying to the point of runoff, apply the spray until it drips off the foliage and runs down the branches and stem. This is used only with ornamentals, not food plants.
11. Thoroughly rinse the sprayer before storing it upside-down and open.

How to Calibrate Granular or Dust Formulations:

Granular and dust formulations of pesticides do not require mixing and often come in convenient ready to use packages. Rates for granular or dust formulations are expressed in several different ways.

A. The label may recommend a pesticide rate based on the length of a row. For example, a label may specify using 40 grams of the formulation on a row 10 metres long. If you have a row 5 metres long you would only need half that amount of pesticide (in this case 20 grams).

B. Recommended rates of granular or dust formulations may be based on a given area. For example, a label may specify using 300 grams per 100 square metres. To determine the amount of pesticide you require:

   (1) Calculate the area you wish to treat by multiplying the length by the width, e.g., Area = 2 m × 5 m = 10 square metres.

   (2) Calculate the amount of pesticide you need for this area, e.g., Recommended rate × Area to be treated

$$\frac{300 \text{ grams}}{100 \text{ m}^2} \times 10 \text{ m}^2 = 30 \text{ grams}$$

   (3) Apply the calculated amount of pesticide evenly over the area.

If you are using a fertilizer type of spreader to apply granules on your lawn, you must first measure the rate of output of your spreader. To do this:

1. Either attach a plastic bag onto your spreader or put a piece of paper or plastic on the ground to catch the granules. This piece should be at least as wide as your spreader and 2 metres long. A longer piece of plastic or paper will help to determine the output more accurately.
2. Put a small, evenly distributed amount of the pesticide in the spreader.
3. Next you want to determine the correct adjustment for your spreader and/or the correct walking speed. Keeping your spreader closed, start walking approximately 3 metres in front of the paper or plastic sheet. When you reach the sheet, without changing your pace, open the spreader so that the pesticide drops onto the sheet. Close the spreader once you have travelled 2 metres (= 2 large steps).
4. Weigh the amount of pesticide on the paper.
5. Measure the width of the spread and the length covered to determine the area treated with the chemical (width of spreader × length travelled). For example, if your spreader is 1 metre wide and the paper 2 metres long you have covered an area of 1 × 2 = 2 square metres.
6. Determine the amount (g) you applied on 1 square metre (1 m^2). (Divide the amount in step 4 by the area calculated in step 5). For example, if you applied 200 grams on 2 square metres, your spreader was dropping 200 ÷ 2 = 100 grams per square metre.
7. Check the label to see if you are applying the correct amount of pesticide. If the label reads: 5 kg/100 m^2 (5000 g/100m^2) you should be applying 50 g/m^2 not 100 g/m^2. In the example too much pesticide is being applied. Adjust spreader to a slower output or increase your walking speed to reduce the pesticide rate and redo your test run until the output rate is correct. To ensure an even coverage, you should go over the lawn twice using half the amount of pesticide each time in a criss-cross pattern. First walk lengthwise up and down the lawn: (Fig. A)

then walk back and forth across the width of the lawn. For the above example you would apply 25 g/m^2 each time.

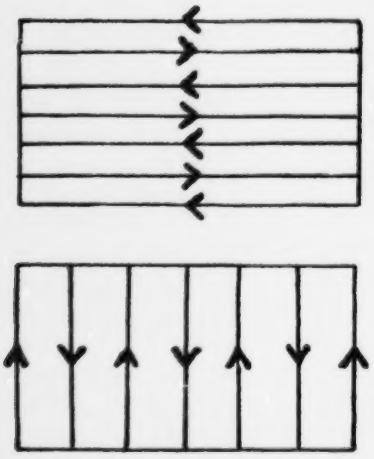


Fig. A
Pattern for pesticide application on a lawn

8. If your spreader cannot be adjusted, measure the area you wish to treat, weigh out the required amount of chemical and evenly distribute it by hand using rubber gloves. A metric weighing scale and metric measuring spoons are now available and should be purchased. See page 7 for Imperial to metric conversions.

PROTECTING POLLINATORS

Wild bees and honey bees are very important pollinators of tree fruit and berry crops. In the pollination process, pollen is transferred from the anthers (male part) to the stigma (female part) of the flower. This transfer is carried out effectively by bees and is very important in those varieties which require cross-pollination to ensure fruit set. Since bees are important pollinators, gardeners have an obligation to protect them from poisoning when insecticides are used.

The following precautions and considerations will prevent or reduce bee poisoning when it is necessary to apply insecticides.

- Avoid application of insecticides while blossoms are open.
- If an insecticide is required, select one that is the least harmful to bees.
- If possible use a liquid rather than a wettable powder formulation of the insecticide.
- Apply insecticides in the evening.
- Do not apply an insecticide during windy periods as drift may adversely affect bees in the vicinity.
- Flowering weeds or ornamentals beneath fruit trees often attract bees. Toxic insecticides applied to the tree will contact the plants below and cause bee poisoning. To prevent this, cut or destroy the weeds and cover blossoming ornamentals before spraying.
- The following insecticides are very toxic to bees and may remain so for up to 3 weeks in some instances: Diazinon, Sevin, Cygon (Rogor), Imidan and Orthene. These insecticides should not be applied to blossoming fruit trees, berries or ornamental plants which are visited by bees.
- Malathion and Methoxychlor if applied in the evening will be less harmful to bees. Applications during the day are more harmful because the bees are active and the chance of contacting the insecticide is more likely.
- The following insecticides are of low toxicity to bees: Thuricide, Kelthane, Pyrethrum (Raid), Rotenone (Derris), and Safer's Insecticidal Soap.

HOUSE PLANTS

GROWING CONDITIONS

Homes offer a variety of climates for plants. Some rooms, such as bathrooms and kitchens, are more humid than other rooms which may have different temperatures and receive varying amounts of light. Try to match these variations in house climate to specific plant needs and you will have healthier plants.

The major problems affecting house plants are usually caused by extremes in temperature and light and unsatisfactory cultural practices, rather than by insects or diseases. Most plants are adaptable to a wide range of conditions found in a home. Be aware of these environmental requirements of your plants and strive to meet their needs. The general requirements of plants are discussed below.

TEMPERATURE

Most plants will grow well in a day temperature ranging from 15°C to 25°C. Night temperatures should be about 5°C lower than day temperatures. Most flowering plants will last much longer in bloom under this temperature regime.

Keep plants from excessive temperature extremes such as hot air ducts or cold, drafty locations near doors or windows. During winter, window sills cool rapidly and the lower temperatures can slow growth for plants located there and may even cause plant injury. This problem is accentuated where drapes are closed at night.

Some plants, such as Christmas cactus and geraniums, require specific temperatures for flower induction. Be aware of specific plant temperature requirements.

WATER

Plants should be watered as needed. The frequency of watering varies with the weather, type and size of plant, the plant's vigor, room temperature and type of pot and potting mix that is used. When watering, soak the soil thoroughly and allow the mix to dry reasonably well before re-watering. Over-watering encourages rotting of roots. Water temperature is important. Use lukewarm water and avoid watering with cold water. If bottom watering is used, top water occasionally to prevent the build-up of fertilizer salts.

FERTILIZER

House plants require the major and minor elements just as garden plants do. If the potting mix does not have a complete fertilizer incorporated in the mix, the easiest way to apply the necessary elements is in a liquid form. During active growing periods, apply a dilute fertilizer on a regular basis (as often as once a week).

Applying fertilizers to plants in dry soil can cause root injury. Be sure the soil is moist before fertilizing. When watering with a fertilizer solution, use the same volume of water as if you were watering normally. Allow the excess solution to drain from the pot to prevent a buildup of fertilizer salts. Use fertilizers according to their label directions.

LIGHT

Plants vary in their minimum light requirements. Locate a plant in your home according to its needs. Generally, flowering plants require higher illumination than foliage plants. Natural light may be supplemented with artificial lighting. Whatever type of artificial light is chosen, it is important to provide not only light intensity but also an adequate duration of light.

Guidelines to light in the house

High Light = full sun.

Bright Light = up to 60 cm from east or west windows, 1.5 m from south windows.

Partial Shade = indirect light, up to 1.2 m from a north window; up to 2.4 m from a south window; up to 1.5 m from an east or west window.

Shade = up to 1.8 m from a north window; 2.4 m from an east or west window; up to 3 m from a south window.

Measurement of Light Intensity Using a Single Lens Reflex Camera

Set ASA at 25, shutter speed at 1/60	Light Intensity
F 2.0— 430 Lux F 2.8— 800 Lux	Shade
F 4.0— 1 600 Lux F 5.6— 3 200 Lux	Partial Shade
F 8.0— 6 400 Lux F 11 —12 800 Lux	Bright Light
F 16 —26 000 Lux	High Light

HUMIDITY

Home humidities are generally lower than desirable for optimum plant growth. Humidity is closely related to temperature. In winter, when heating systems are in use, humidities can be quite low. Misting plants is not the recommended way to raise humidity levels. Misting provides only temporary relief and can encourage foliar

diseases. Increase humidity in the vicinity of plants by grouping them together. Plants may also be set on trays of moist sand or fine gravel. Kitchens and bathrooms generally have higher humidity levels and thus relocation of plants to these areas is desirable if other environmental conditions can be met.

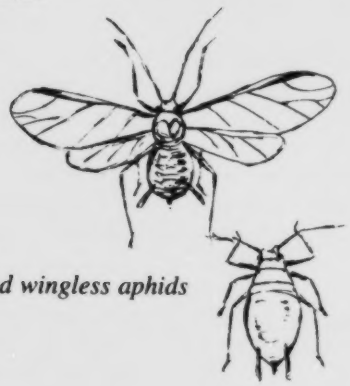
IDENTIFICATION OF COMMON PROBLEMS WITH HOUSEPLANTS

SYMPTOMS	POSSIBLE CAUSES
Brown or yellow leaves	Occasional yellowing of lower leaves is natural, due to insufficient light. Temperature extremes, chills and drafts, overfeeding, low humidity, not enough fresh air, over-watering, underwatering or underfeeding can cause discoloured leaves.
Yellow or white rings and spots on leaves	Splashing cold water on foliage while watering plants can result in rings and spots on the leaf surface.
Leaf drop	Usually leaf drop is caused by a sudden change in the environment; especially temperature or light intensity, cold water, dry air, transplanting shock, overwatering or overfeeding.
Bud drop	Temperatures too hot or cold during bud development, shocks due to poor humidity, drafts, or moving from the greenhouse into the home can cause bud drop.
Slow growth	During winter, slower growth is probably due to poor light or natural dormancy. Otherwise it is usually a result of overwatering or underfeeding, but can also be caused by sour, undrained soil, and cramped or dry roots.
Loss of foliage, pale colour, weak growth	Overwatering, lack of fertilizer, insufficient light or high heat, are causes of poor plant growth.
Yellow or brown spotted leaves	Overwatering, sun scorch from direct sunlight, drought, water left on the leaves in the hot sun, insects, or damage from pesticides can result in spotting.
Dry crumbly leaves	High heat, low humidity, overfertilizing, or pesticides can damage leaves.
Wilted leaves, new growth small	Overcrowded roots give above-ground symptoms of wilted leaves and stunted new growth.
Abnormally long stems, leaves long and pale	Insufficient light causes leggy plant growth.
Leaves curl under, new leaves are small and compact	Too much light and, on occasion chilling injury, shows as downward cupped leaves and stunted new growth.
Collapse of plant	Plants can collapse due to extreme heat or cold, gas fumes, poor drainage causing root rot, sudden change in environmental conditions or possibly bacterial or virus disease. The latter is highly unlikely, particularly if the soil is sterilized before use.
Mushy, dark stems, rotting	Too much water, particularly in cold weather, poor drainage, poor ventilation or fungal attack encouraged by damp, cold conditions can cause rot.

SYMPTOMS	POSSIBLE CAUSES
Swelling on leaves and corky ridges, water soaked spots that turn red or brown	Oedema occurs when the plant has absorbed too much moisture because of warm moist soil and cool moist air. To stop this, raise heat, lower humidity, and place pot where soil will not heat.
Tips of leaves turn brown	Poor humidity, potash deficiency, or underwatering are causes of tip burn.
Plants bear few flowers and excess foliage	Too much nitrogen has been supplied if the plant produces excessive foliage.
Lower leaves turn yellow and remain on the plant, new leaves are small and stems are stunted	Lack of fertilizer, particularly nitrogen, causes poor plant growth.
White crust on soil	Buildup of fertilizer salts; can be leached away with water or the plant can be repotted.
Wilting	Wilting can be caused by insufficient water, too much heat or light. If these are not to blame, there may be root damage caused by overwatering, pests, or overfertilizing.
Yellowing between the veins of young leaves, older leaves are less severely affected	Iron or magnesium deficiency.

INSECTS AND DISEASES OF HOUSE PLANTS

DESCRIPTION	CONTROL
Aphids Aphids can attack a wide range of plants. They are small (2-3 mm long), soft-bodied, pear-shaped insects that feed on plant sap. Aphids can be winged or wingless, varying in colour from green to yellow, brown or black, usually occurring in clusters or "colonies" on the underside of leaves. Affected plants are wilted with yellow, twisted and curled leaves that eventually drop off. Plant growth is stunted and new buds malformed. Sap-sucking insects, such as aphids, secrete a sticky substance called honeydew which forms a shiny film on the leaf surfaces. An undesirable black sooty mold can grow on the honeydew. (See Sooty Mold page 24). In addition, aphids during feeding can transmit many viruses to plants.	Aphids are best controlled as soon as they are noticed before plant leaves begin to curl and aphid colonies develop. Hand picking or thoroughly spraying with water will remove the aphids. A variety of insecticides can be used against aphids but note that houseplants are sensitive to pesticides. First try applying the insecticide to only a few leaves and then wait several days for any damage that might develop. If no damage occurs, that insecticide is safe to use on that plant. Treat plants when insects are first seen with: Safer's Insecticidal Soap at 20 ml/L of water; or Pyrethrum 0.2% D according to label directions; or Rotenone 1% D according to label directions; or Malathion 50% EC at 2 ml/L of water; or Diazinon 12.5% EC at 6 ml/L of water.



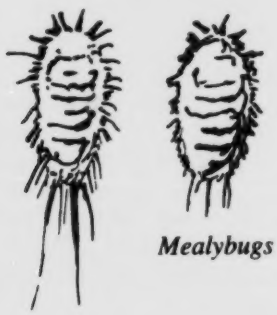
Winged and wingless aphids

Bacterial Diseases These are difficult to control and can only be properly identified through laboratory diagnosis. Root and stem rots, wilts, leaf spots, and galls on various parts of the plant can be caused by bacteria.	To reduce the chances of bacterial infection, soil sterilization and good cultural practices are essential.
Botrytis Blight (Gray Mould) This fungal disease can develop on any aboveground part of the plant as a result of high humidity or overcrowding, or if dead leaves or blossoms have been left on the plant. Symptoms vary from plant to plant but the disease generally appears as a fuzzy gray growth.	Remove old leaves and flowers, increase ventilation and keep in drier conditions. Treatment with a recommended fungicide may be necessary.
Crown, Stem or Root Rot The micro-organisms that cause these problems thrive in moist conditions, so plants which have become unthrifty as a result of overwatering are highly susceptible to infection. At first, the leaves droop and the plant appears to need water; stems and roots usually turn dark, mushy and rotten; lower leaves become dark and waterlogged. The entire plant may collapse.	If detected in the early stages, further damage may be prevented. Place the plant in a dry, ventilated room and withold water until progress of the disease is halted. You may need to remove the damaged portions, rerooting the top part if necessary. Cacti and succulents are particularly susceptible to stem and root rot. They should always be kept fairly dry, particularly during winter months.

DESCRIPTION	CONTROL
Damping Off	
A number of soil-located fungi attack seedlings and cuttings, causing them to rot at the base. Affected plants collapse and die. Damping off fungi also cause seed decay.	Use a sterile porous rooting medium; avoid overcrowding of seedlings; do not overwater and choose a well-ventilated area.
Fungus Gnats	
These flies are gray, delicate and about 3 to 6 mm long. The young are white maggots, found on decaying plant matter. They thrive in moist soil. The adults are a harmless nuisance, but the maggots can injure the roots and crown. Affected plants appear stunted, and foliage may drop.	Reduce the amount of water and let the soil dry. The most effective control is to remove the plants from the infested soil, thoroughly wash the roots and repot in sterilized (heated) soil. If these suggestions cannot be followed, drench the soil with a solution of Malathion 50% EC at 1 mL/L of water.

Fungus gnat adult

Leaf Spots, Flower Spots and Blight	
The spores of these fungi are spread by air currents or water. Infection only occurs under moist air conditions or if standing water is left on the foilage for prolonged periods.	Avoid wetting the foliage when watering. If plants require high humidity, follow the suggestions on page 17.
Mealybugs	
Mealybugs are tiny, woolly, white insects looking like bits of fluff. They are found on stems and undersides of leaves, especially where the plant branches. They are protected by a white, waxy covering. Like aphids, they excrete honey-dew which forms sticky patches and acts as a medium for the growth of black, sooty fungus. Mealybugs suck plant sap, causing stunted growth and the eventual death of the plant.	Use the same control as for aphids (page 21).



Mealybugs

DESCRIPTION	CONTROL
Mites	
Most forms of mites are too small to be seen without the aid of a hand lens. They are found on the underside of the leaves and resemble fine dust. Their colours range from red to brown or green. Spider mites spin fine webs between the leaves to form a canopy under which they feed. Mites suck plant juices, giving the leaves a yellowish speckled appearance. Eventually, the leaves turn brown and fall off, the whole plant appears stunted and new leaves and buds may be deformed. Cyclamen mites are a common pest of ivy and African violets, deforming or inhibiting leaf growth. Blackening of infested parts is common. Any plant growing in a hot, dry location is susceptible to mite attack.	Control measures must be taken immediately because mites multiply so rapidly. If thorough bathing with water does not halt the problem use: Safer's Insecticidal Soap at 20 mL/L of water: or Kelthane 18.5% EC or WP at label rates: or two applications of Malathion 50% EC at 2 mL/L of water applied ten days apart.
Nematodes	
Nematodes are microscopic pests that burrow into root tissue or foliage. Root nematodes may cause lesions, swellings or galls to appear on the roots. Infected plants become discoloured, as if suffering from mineral deficiency; flowering is reduced, and the whole plant collapses as more roots are damaged. When repotting plants, always check for signs of root nematode disease. Foliage nematodes move invisibly in moisture on leaves and stems; they feed from inside the leaf. Some species cause dark brown markings on the upperside of leaves, and small brown spots and water-soaked margins on the undersides of leaves. Nematode diseases are extremely rare in house plants, and again can be identified only through laboratory diagnosis.	Once a plant becomes infested with nematodes, nothing practical can be done to cure it. To prevent an infestation, use sterile potting soil.
Powdery mildew	
House plants, in humid, poorly-ventilated conditions are particularly susceptible to powdery mildew. It appears on any above-ground part of the plant as a white, powdery growth. In the early stages it spreads slowly, and will not cause much harm to the plant. Powdery mildew spores are spread easily by air currents; they are one of the few fungal spores not requiring free water to germinate. Begonias, African violets and roses are often affected by powdery mildew diseases.	When powdery mildew develops, move the plant to a drier location with proper ventilation and remove damaged parts. There are several fungicides which can be used for control of this disease. Most of these fungicides contain benomyl, dinocap, sulphur or combinations of these ingredients. Apply according to label instructions.

DESCRIPTION

CONTROL

Scale

Scale insects are round or oval insects up to 4 mm in diameter with a waxy, shell-like covering. Colours range from tan to brown or black. They are found on the stems and leaves where they suck plant juices causing poor, stunted growth. Scales favor tough, leathery plants. The honey-dew excreted by scale insects gives leaves a shiny sticky appearance. Sooty mold grows on the honeydew. (See Sooty Mold below.)

Scrub the scales off with a wet toothbrush. Malathion can be used, but may not penetrate the shell-like covering of the scale insects. Try to loosen the scales from the plant before spraying with:

Safer's Insecticidal Soap at 20mL/L of water.

or Malathion 50% at 2 mL/L of water.

Do not use insecticides on ferns.

Scales

Mature *Immature*

Sooty Mold

The black fungal growth on the sticky honey-dew secretions of sap-sucking insects is called sooty mold. It does not harm the plant unless present over a large area, where it could interfere with photosynthesis.

Control is aimed at the insects producing the secretion; a soap and water solution will remove the sooty mold.

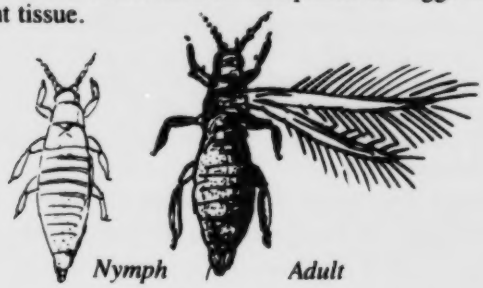
Springtails

Springtails are commonly found in the soil of house plants or seen hopping on the surface after watering. Most species are white, ranging in length from microscopic to 5 mm. They thrive in moist soil where they can feed on a great deal of decayed organic matter. Their presence is often an indication of overwatering. They may attack seedlings or tender plant parts.

Springtails may be controlled by treating the soil with a malathion or pyrethrum solution. Repeat applications may be necessary. Transplanting to new clean soil will also help reduce threat of damage. While transplanting, dip the plant roots with some adhering soil into the spray solution to kill the remaining springtails.

Springtail

DESCRIPTION	CONTROL
Thrips	
Several species of thrips may infest house plants. Thrips are small, slender pests, the young being whitish to yellow or orange and the adults brown or black. Adults are hard to see because they fly about the plant, especially when disturbed. They feed by rasping the plant tissue and sucking the juice, causing a silvery, speckled appearance to leaf surfaces. Dots of black excrement cover a badly infested plant and small scars are formed where each female places her eggs in the plant tissue.	Control thrips with materials recommended for aphid control (see page 21).



Thrips

Virus Diseases	
Viruses multiply only in living plant cells. These parasitic micro-organisms are spread by certain sucking insects, on tools or through handling. They cause a variety of symptoms: Stunting, ring spots, mosaic, vein banding and abnormal leaf growth. They seldom cause serious problems with house plants.	
Whiteflies	
These small, delicate, white insects suck the plant juices and are usually found on the undersurface of leaves or fluttering about the plant. Leaf surfaces are covered with sticky honeydew excreted by these insects. Leaves become pale or discoloured.	Use materials recommended for aphid control. (See page 21). Apply sprays at 3-day intervals until no whiteflies are seen.

Whiteflies

Wilts	
Some types of fungi and bacteria enter the plant roots through the soil and interfere with the water-conducting ability of the plant. Leaves wilt and become pale, eventually turning brown; growth is reduced and the plant may soon die. In this instance the plant may have been infected prior to purchase, the change of conditions then making it more susceptible to disease.	Infected plants cannot be cured. Healthy cuttings can sometimes be taken from the upper parts of the affected plant and rooted in a sterile medium. The pot should be disinfected before re-use.

COMMON INSECTS AND DISEASES OF VEGETABLES

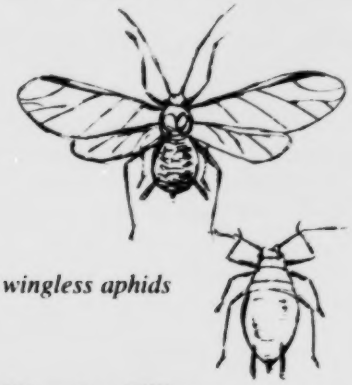
DESCRIPTION

CONTROL

Aphids

Nearly all vegetables are susceptible to aphids. They are small (2–3 mm), variously coloured, soft-bodied insects that usually occur in clusters or colonies on the underside of leaves. Aphids are pear-shaped, winged or wingless, sap-sucking insects.

Affected plants are wilted, stunted and new buds are malformed. The leaves turn yellow and become twisted and curled. A shiny, sticky film on the leaves is honeydew secreted by the aphids. Aphids while feeding can transmit virus diseases of plants.



Winged and wingless aphids

Aphids are best controlled as soon as they are noticed when colonies are small and before plant leaves start to curl. Do not spray if large numbers of predatory lady bird beetles and lacewings are present. (See page 106).

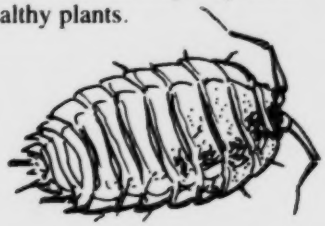
In some instances it is possible to remove aphids by hosing down the plant with water. Once knocked off tall plants, wingless aphids are rarely able to return.

If an insecticide is required, treat plants when aphids are first seen with:

Safer's Insecticidal Soap at 20 mL/L of water;
or Rotenone 1% D according to label directions;
or Pyrethrum 0.2% D according to label directions;
or Malathion 50% EC at 2 mL/L of water;
or Diazinon 12.5% at 6 mL/L of water.

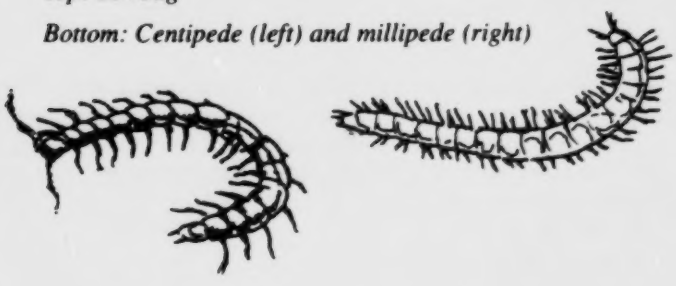
Centipedes, Millepedes, Pillbugs (Sowbugs, Woodlice)

These flattened, worm-like creatures with many legs are up to 4 cm long and commonly occur in compost heaps or decaying vegetation. Occasionally they feed on foilage and stems of healthy plants.



Top: Sowbug

Bottom: Centipede (left) and millipede (right)



Centipedes, millipedes, and pillbugs are often present where there is a lot of organic matter. They usually are not damaging except to young seedlings. If control is required spray areas where damage occurs with:

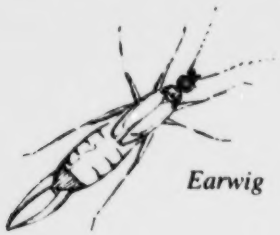
Diazinon 12.5% EC at 12 mL/L of water;
or Sevin 50% WP at 6 mL/L of water.

Do not spray seedlings directly.

DESCRIPTION	CONTROL
Cutworms	
Young plants are cut off at or just under the soil surface by cutworms. They are fleshy, soft-bodied caterpillars up to 4 cm long, curl up when disturbed, and may be found in the soil near damaged plants. Some of these pests climb plants at night to feed on the foliage and then return to the soil during the day.	Protect plants from cutworms by placing a collar around them at transplanting time. Use tin cans, milk cartons or tarpaper as collars for plants such as tomato and cabbage. This method is unsuitable for closely seeded plants such as peas and beans. When collars cannot be used, apply Diazinon 5% G around the base of the plants and work into the top 2.5 cm of soil. To protect seeded rows, apply Diazinon 5% G over the rows and work into the top 2.5 cm of soil before seeding. For climbing cutworms, spray with: Sevin 50% WP at 6 mL/L of water; or apply Sevin 5% D according to label directions. A bait consisting of 1.8 kg of bran, 1.7 L of water and 450 g of Sevin 50% WP will effectively protect young transplants and seedlings. Scatter this mixture around the base of vegetables, using about 5 mL per plant for larger plants such as cabbage. The removal of crop residue and weeds in August will reduce the incidence of cutworms in the following year.

Cutworm

Damping-Off	
Soil fungi attack seedlings before they emerge causing the seed to decay or the seedling to die. Seedlings may be attacked near the soil line after emergence causing them to topple over. Some plants survive but carry a scar known as wirestem near the soil line. Such plants should be discarded as they will never produce a thrifty plant.	Under warm, fairly dry soil conditions damping-off is seldom a problem. However, when seeding early in wet soil, losses can be severe. To avoid damping-off: do not seed too early; treat seed with captan or thiram if not already treated; provide good ventilation in the cold frame or greenhouse; avoid excessively dense plantings; space seedlings. If damping-off appears, water or spray with captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations. The interval between last application and harvest is seven days.
Earwigs	
Holes in the leaves of vegetables can be caused by earwigs. Most damage occurs at night because earwigs hide in soil crevices or debris during daylight hours. These insects are 1.6 cm long, dark brown, with a prominent pair of pincers at the rear end.	Apply control measures in May and June before young earwigs appear or when damage is first noticed. Since earwigs hide in the daytime, they can be trapped in rolled or folded newspaper placed near plants overnight. Also flower pots with some tissue paper in the bottom, placed upside down on stakes in flower beds and elsewhere, will trap earwigs in the tissue paper. Burn the trapped earwigs each day. For additional control, spray area with: Sevin 50% WP at 6 mL/L of water. or Safer's Insecticidal Soap according to label directions.



Earwig

DESCRIPTION

CONTROL

Flea Beetles

Numerous small round holes in the leaves of cabbage, turnips, cauliflower, radishes, potatoes, beans, tomatoes and peppers are caused by small (3 mm) black beetles that jump readily.

Flea beetle

Fast-growing plants will normally outgrow flea beetle damage. Do not place transplants out too early in the season.

If holes are numerous, plants can be treated with:

Rotenone 1% D;

or spray with Sevin 50% WP according to label directions.

See "Tuber Flea Beetle", page 42.

Garden Springtails

These small (2-3 mm) pests damage emerging seedlings by chewing small holes in the leaves. Plants may die if severely affected.

Look for small, gray to black, wingless insects that jump like fleas.

Garden springtails are present in large numbers on the soil in spring.

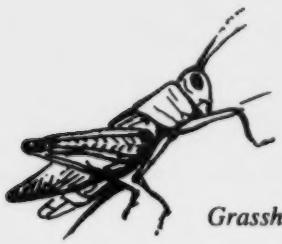
Springtail

Keep a close watch on seedlings for the first signs of damage and, when it occurs, use a dust containing Diazinon, Malathion or Sevin on affected seedlings and surrounding soil. Also treat garden paths, especially in shaded places.

Re-examine the treated area one week later, and repeat treatment if necessary.

Grasshoppers

Most garden plants can be attacked by these leaping insects. Winged adult grasshoppers appear in mid-summer and fly into garden areas. They are up to 3 cm long.



Grasshopper

The small numbers of grasshoppers on coastal areas are not necessary to control. In dry areas of the interior, when young wingless grasshoppers appear, spray damaged edible plants and any grass or foliage surrounding the garden. Repeat later when the winged forms appear. Use:

Malathion 50% EC at 2 mL/L of water;

or Sevin 50% WP at 6 mL/L of water.

DESCRIPTION

CONTROL

Leatherjackets (Marsh Crane Fly)

This insect may damage young flower or vegetable seedlings and transplants. It feeds on grass roots causing irregular brown patches to appear in the lawn.

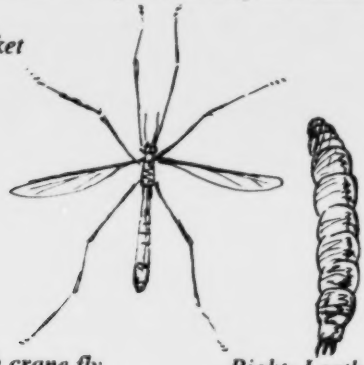
Look for brown-grey, worm-like maggots up to 3.8 cm long, at or just below soil surface.

These insects are a problem only in coastal areas.

If present the previous year, or if more than 20 maggots are found per 900 cm^2 of turf, spray the lawn once between the first of October and the end of May, when the ground is not frozen. Apply:

Diazinon 12.5% EC using 30 mL in enough water to cover 10 m^2 of lawn.

Leatherjacket



Left: Marsh crane fly *Right: Leatherjacket*

Nematodes

Nematodes are microscopic pests not visible to the naked eye. They can burrow into and feed on plant roots. The degree of injury depends on the crop and growing conditions. Root nematodes may cause lesions, swelling or galls to appear on roots. Infected plants become stunted, unthrifty and prone to wilting. Leaves can become discoloured as if the plant had a nutrient deficiency. Nematode diseases can be accurately identified only by a laboratory diagnosis.

Control is seldom necessary in a home garden although perennial crops such as strawberries, raspberries and bulbs may on occasion be seriously damaged. Clean cultivation, rotation, and care in obtaining clean planting stock when starting new crops are all useful nematode control measures.

Slugs

Slugs are soft bodied, snail-like creatures without shells. They vary in size from .3 cm to 10 cm and may be orange, grey, brown or black. They are most active at night or during damp weather.

This pest damages the foliage of most garden plants making large ragged holes in the leaves. Look for silvery, slimy trails on soil, grass and foliage as evidence of slugs.

Slug

Slugs favour damp, shaded areas, so removing vegetative trash and other daytime hiding places will help to control them.

If slugs are an annual problem, apply control measures early when slugs are first noticed.

Planks can be placed on the ground overnight and the next day any slugs sheltering underneath can be destroyed.

Place slug bait containing Mesurol or Metaldehyde in areas where the silvery, slime trails are evident. To protect pets, the bait should be placed under propped up boards, rocks or in a bait protector made out of a coffee can (see page 70). Several holes are made along the bottom sides of the coffee can using a can opener. Bait is placed in the bottom of the coffee can and the lid is replaced.

or Scatter slug bait containing Metaldehyde;

or Spray Metaldehyde 20% solution at 6 mL/L of water on plants before the edible plant parts have formed. DO NOT APPLY METALDEHYDE ON EDIBLE PARTS OF PLANTS.

DESCRIPTION	CONTROL
White Grubs (larvae of June beetles) Grubs feed on the roots of many plants injuring garden seedlings or transplants by cutting the main stem or roots below the surface. They also tunnel into tubers and freshly-rooted plants. White grubs are large, curved, ("C" shaped), and have cream coloured bodies with brown heads. They are found in the soil and may be numerous on land that was recently in grass sod.	Whenever possible, dig or till sod land one year before planting and keep it fallow that year. If white grubs are numerous in the soil or if damage was noticed in the previous year, protect seedlings with: Diazinon 5% G at label rates. Broadcast the granules over the area to be seeded just prior to planting, and work into the top 8 to 15 cm of soil. White grubs have a long life cycle (3 years), so reinfestation is unlikely to occur after control has been obtained.

White grub

Wireworms Many types of garden plants are damaged by wireworms. Seedlings wilt and die, and root crops are tunneled. These worms are slender, up to 3 cm long, hard-bodied, yellow and shiny. They infest soil that was recently in grass sod.	Grassy areas dug up and planted for the first time often have wireworm problems. Whenever possible, dig or till sod land one year before planting and keep it fallow that year. If damage occurred the previous year, protect seedlings with Diazinon 5% G at label rates. Broadcast over the area to be seeded just prior to planting. Apply when the soil is warm (over 10°C), and work into the top 8 to 15 cm of soil.

Wireworm

DESCRIPTION CONTROL

ASPARAGUS

Asparagus Aphid

Asparagus aphids are small green, soft-bodied, sap sucking insects up to 1.5 mm in length. They are usually found feeding at the base of leaves and on small branches.

Aphid infested plants develop a "witches' broom" type of growth and produce numerous thin spears. Infestations which occur as spears are opening, produce the most severe growth distortion and fern damage. Roots and crowns are also damaged from above-ground aphid feeding. Crowns surviving infestations produce only a few late, weak spears the following spring.

Currently, this pest is found only in the Okanagan and Similkameen Valleys as far north as Armstrong and Spences Bridge.

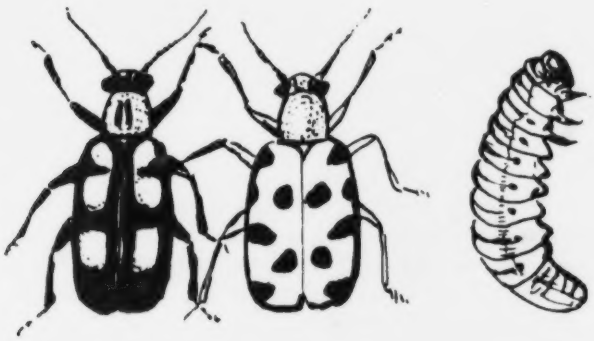
Destroy or burn old fern growth to control the overwintering eggs.

1. Protect young plantings with Malathion 50 EC at 2 mL/L of water. Apply sprays when aphids first appear or as new plant damage occurs.
2. Spray established plantings after harvest when spears are developing into fern growth. Use Malathion as above with enough water and pressure to cover and penetrate fern growth. Repeat spray as required.

Malathion sprays will give better results when used at temperatures over 20°C.

Asparagus Beetle

Foliage and spears are eaten by larvae (up to 8 mm long) and beetles (6 mm long). The beetles may be either blue-black with yellow spots, or red with black spots. Larvae are either gray or orange. Eggs are oval and black and attached to spears.



Asparagus beetles and larva

Remove and burn plant debris after it dries in the fall to prevent adult beetles from overwintering in it and becoming active next year.

If beetles or grubs are present on spears, spray with:

Malathion 50% EC at 1 mL/L of water;
or Methoxychlor 25% EC at 7.5 mL/L of water;
or Sevin 50% WP at 6 mL/L of water.

Keep up control measures when beetles or larvae are on fronds in summer.

Rust

Elongated orangey-red powdery areas appear on stems and foliage, turning dark brown in the fall.

Plant resistant varieties such as Mary Washington or Viking.

Remove and burn plant debris after it dies down in the fall, as this is a source of infection for the next year's crop.

DESCRIPTION CONTROL

BEANS

Aphids

See page 26.

Flea Beetles

See page 28.

Gray Mould

Gray mould appears on stems and pods in wet weather.

Provide adequate spacing between rows, and avoid prolonged or repeated sprinkling.

Root Rot and Poor Germination

Beans fail to emerge or become stunted after prolonged wet weather.

Avoid planting in low, poorly drained areas where the soil is too wet. Delay seeding until mid-May or until soil temperature is above 15°C.

If the seed has not already been treated, dust it with captan or thiram seed protectant prior to seeding.

The use of captan has been reviewed. Check new labels for current recommendations.

Rust

On pole beans, dusty red spots appear which later turn black.

Stay out of the bean planting when the foliage is wet to avoid spreading rust spores from infected to healthy plants.

Use new poles or disinfect the old ones with:

Formalin 40% sol. at 37 mL/L of water;

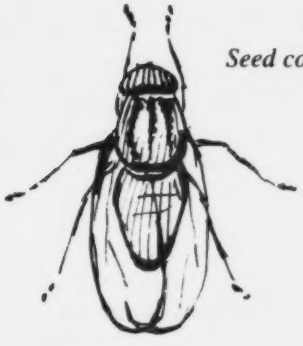
or lime sulphur at 100 mL/L of water.

Seedcorn Maggots

The maggots resemble cabbage root maggots. They attack slowly germinating and rotting seed.

Germinate seeds prior to sowing to avoid time loss due to poor viability of the seed. Shallow seeding when soil temperature is 15°C or warmer will promote quick emergence and avoid maggot damage. Use fungicide-insecticide treated seed.

Seed corn maggot



Adult

Larva

See Table of Pesticides Trade Names Page 107.

DESCRIPTION	CONTROL
Springtails See page 24.	
White Mould White mould appears on stems and pods, especially in wet weather.	Rotate beans with beets, onions, spinach, corn or grass. Provide adequate spacing to enable foliage to dry quickly. When watering, water the ground and keep the foliage dry.

BEETS

Leaf-Miners White maggots of a small fly feed inside the leaves, causing colourless blotches. They also infest leaves of Swiss Chard and the weed, Lambsquarter.	Keep garden free of Lambsquarter weed. Normally additional control is not required. If leaves are to be used as greens, simply discard infested leaves.

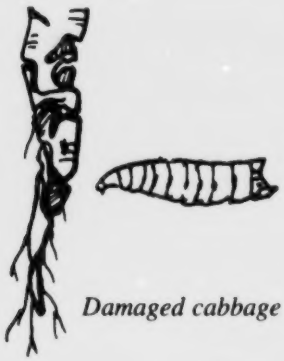
See Days to Harvest Table—Inside Back Cover.

DESCRIPTION CONTROL

CABBAGE, CAULIFLOWER, BROCCOLI BRUSSELS SPROUTS and KOHLRABI

Cabbage Maggot

The adult is a grey fly, half the size of a housefly, which lays eggs at the base of plants. Legless, white maggots (7 mm long) hatch out of the eggs, tunnel roots that cause rot and wilting of the plant. This insect will also attack cauliflower, broccoli, brussels sprouts, turnips, radishes, alyssum, stock, and mustard.



Damaged cabbage root and maggot

Cabbage maggot may not be a problem in a new garden. Once it occurs it is difficult to control.

Destroy all crop debris by burying or composting immediately after harvest. Remove maggot infested roots and dispose or burn them.

Control weeds which may be alternate hosts for the root maggot. Rotate crops so that members of the cabbage family are not continually planted in the same site.

Delay planting until after mid-May to reduce the severity of attack from first generation flies.

Tar paper collars or rings can be placed around the base of each plant to deter the adult fly from laying eggs.

Adult flies can be caught on grey sticky board traps. The adult fly is attracted to shades of grey and becomes stuck to the sticky surface. Sticky traps are easily made by painting boards (20 cm × 30 cm) grey, coating the surface with adhesive material (tanglefoot, stick-em) and attaching these boards to small posts in the garden planting. The surface of the sticky board must be cleaned and renewed every several days. Considerable damage can still occur if there is a high infestation of root maggots.

If infestation the previous year was severe, it may also be necessary to apply:

Diazinon 5% G at 19 mL/10 m of row;

or use 2 mL Diazinon 5% G per plant. Place in the furrow with seed or transplants. Twenty-eight days later, drench 10 cm of soil around the base of the plants with:

Diazinon 12.5% EC at 3 mL/L of water. Apply 170 mL of mixed spray to each plant. Repeat this treatment every 7 to 10 days when plants are young.

Caterpillars and Loopers

Caterpillars and loopers feed and make holes in the leaves. Radishes and turnips are also damaged.

Caterpillars are velvety green up to 3 cm long. White or pale yellow butterflies, seen near the vegetables, lay eggs which later develop into more caterpillars.

Hand pick the caterpillars from vegetables if they are not too numerous.

If further control is required, treat when worms are seen, or their damage is noticed. Use:

Malathion 50% EC at 3 mL/L of water;

or Sevin 50% WP at 6 mL/L of water;

or Thuricide 1 mL/L;

Close to harvest use Rotenone 1% D according to label directions.

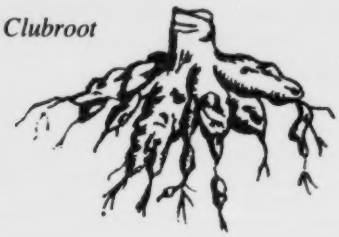
See Days to Harvest Table—Inside Back Cover.

DESCRIPTION

Clubroot

Plants with clubroot are sickly and stunted with large, irregular lumps and swellings on the roots.

Clubroot



CONTROL

Avoid introducing this disease into your garden by growing plants from seed, or planting only healthy transplants.

Once the fungus is established, it may be kept at a low level by following a long rotation in which members of the cabbage family are not planted in the same area more than once in every four years. Early plantings are more likely to escape serious infection. Do not place diseased plant roots in the compost; remove them to a garbage dump or burn them. Agricultural lime will also reduce infection. Work 725 g/m^2 into the soil before planting or mix a handful of lime with the soil in each transplanting hole just before planting.

Flea Beetles

Flea beetles make small holes in the leaves and are usually more severe on young plants. (See Flea Beetles, page 28).

Treat as for caterpillars, or use:

Diazinon 12.5% EC at 10 mL/L of water.

CARROTS

DESCRIPTION

Carrot Rust Fly

The adult is a small shiny black fly with yellowish legs and a yellow-brown head. Eggs are laid in soil near plants. Yellowish-white, legless maggots (6 mm long) feed on roots of parsley, carrots, parsnips, dill and celery leaving rust-coloured tunnels. The leaves take on a rusty appearance, plants become stunted, the roots deformed and the plants may be killed.

Carrot damaged by maggots of carrot rust fly

CONTROL

In areas where there are few carrots grown, rust fly is usually not a problem for the first few years.

Carrot rust fly is more of a problem in a cool season than during a hot one.

If carrot rust fly was a problem, destroy all crop debris by burying or composting immediately after harvest. Remove maggot-infested carrots and place them in the garbage, do not compost.

Control weeds of the carrot family which are alternate hosts of the carrot rust fly. Rotate for several years with crops other than those of the carrot family.

Delay seeding of the main crop until after mid-May to reduce the severity of attack from the first generation flies.

If infestations are severe and control is still required apply:

Diazinon 5% G at 14 mL/10 m of row in furrow with seed when seeding after May 1. Twenty-eight days later, drench 5 cm on each side of the row with:

Diazinon 12.5% EC at 6 mL/L of water.

Use 1.5 L of mixed spray per 10 m of row. Repeat this treatment every seven to ten days.

Intermittent harvesting and spraying for the carrot rust fly can be carried out providing the correct number of days to harvest have elapsed after the last spray. If diazinon has been applied, 10 days must pass before the carrots can be harvested.

Leaving part of the row unsprayed permits harvesting while the rest of the row is protected by the spray treatment.

DESCRIPTION	CONTROL
Sclerotinia Watery Soft Rot	
Carrots are infected in the ground but usually rot in storage, producing a white mould which spreads rapidly under warm, moist conditions.	Rotate as outlined for beans. (White Mould page 33). If late-seeded carrots are to be wintered in the ground, select a well-drained area. Discard rotted carrots in the garbage dump. Do not place them on the compost pile. Disinfect storage containers.

CORN

Loopers	
Olive green caterpillars up to 3 cm long with a pale head and lightly striped body chew into the centre of young corn plants. They have three pairs of legs at the head end, two or three pairs of fleshy legs at the rear and move with a looping action. Young plants can be killed if the growing point is eaten.	When first signs of damage are observed, spray with: Sevin 50 WP at 6 mL/L. Do not apply when corn is tasselling to prevent bee kills. (See page 16, Protecting Pollinators). Direct the spray into the whorl of leaves so that the spray runs into centre of plant where loopers feed.

CUCUMBERS

Cucumber Leaf Spot	
Black spots appear on the leaves in late summer and early fall. Under severe conditions, such as prolonged rainfall, leaves may be destroyed.	Avoid overhead sprinkling. Check seed catalogues for resistant varieties. Clean up crop refuse at the end of the season. No chemical control is available.
Cucumber Scab	
Angular spots appear on the fruit and leaves. Spots on the fruit become sunken, dark green and exude sticky droplets.	To reduce sources of infection, remove and dispose of all infected plant debris from the garden, but do not place it on the compost heap. Follow a three year rotation. If scab is a regular problem in your garden, select scab-resistant varieties listed in vegetable seed catalogues.

LETTUCE

Fungus and Bacterial Rots	
Plants will die at various stages up to harvest. Heads may rot shortly after harvest.	Space head lettuce at least 25 cm apart to allow good air circulation. Avoid watering near harvest. Harvest promptly when mature, and destroy crop refuse at the end of the season.

See Table of Pesticides Trade Names Page 107.

DESCRIPTION CONTROL

ONIONS

Downy Mildew

Leaves become covered with a purplish-grey growth. The leaves then wither from the top down and the plants die prematurely. Resistant spores may over-winter on bulbs, crop refuse and in the soil.

Plant in open, sunny locations well removed from over-wintered onion crops. Avoid sprinkler irrigation after July 1. If mildew is a recurring problem, start a spray program about June 1 and repeat every 7 to 10 days. Use a fixed copper spray (49–53% active) at 9 mL/L of water. A wetting agent may be required.

Neck Rot

Bulbs rot during curing or storage. The rot usually starts in the neck and spreads to the rest of the bulb. Rotted tissue becomes water-soaked and soft, then covered with a grey mould, speckled with hard, black bodies.

When growing onions from seed, use early-maturing, tight-necked varieties such as Autumn Spice, Rocket, and Autumn Splendor.

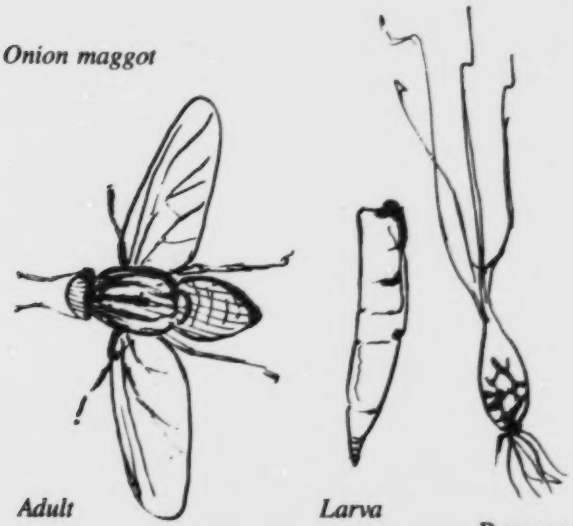
Lift bulbs immediately after tops are down, and dry thoroughly for 10 to 14 days in the sun or slatted curing crates protected from rain. Artificial drying may be necessary in wet seasons.

Store onions in well-ventilated storage at cool temperatures between 0°C to 10°C with low humidity.

Onion Maggot

The adult is a small, grey, bristly fly, smaller than a housefly, laying eggs at the base of plants. Small, white maggots (8 mm long) feed on roots and tunnel into the base of bulbs. Damaged areas become decayed. Young plants wilt and die.

Onion maggot



Adult *Larva* *Damaged onion*

Immediately after harvest remove crop debris to the garbage dump.

Rotate with other crops so that onions are not continually planted in the same site.

Delay planting until after mid-May to reduce the severity of attack from first generation maggots.

Use yellow sticky-board traps (see cabbage root maggot page 34) to catch the adult flies.

If infestation was severe the previous year and control is still required apply:

Diazinon 5% G at 14 mL/10 m of row;
or Ethion 5% G at 14 mL/10 m of row in furrow with seed.
or spray the foliage with Diazinon 12.5% EC at 6 ml/L of water. Use 1.5 L of mixed spray per 10 m of row. Repeat this treatment every seven to 10 days.

See Days to Harvest Table—Inside Back Cover.

DESCRIPTION

CONTROL

Thrips

Thrips are very small (1 mm), slender, yellowish to brown insects which may be winged or wingless. Adults are difficult to see because they fly about the plant especially when they are disturbed. They feed and damage the plant by rasping the tissue and sucking the sap. Leaves take on a silvery, speckled appearance.

For illustration see page 25.

Thrips are not a problem on the coast.

Good weed control will keep thrip populations low.

When thrips are first seen, spray with:

(Diazinon 12.5% EC at 6 mL/L of water.)

Foliar sprays used to control onion root maggot will also control thrips.

PARSNIPS

Carrot Rust Fly

See page 35.

PEAS

Pea Enation Mosaic Virus

Peas from allotment and home gardens on southern Vancouver Island, the Lower Mainland and Kelowna have recently been affected by this virus disease. Leaves develop clear spots, a mosaic pattern, and/or brown flecks and streaks. Severely infected plants have enations (swellings) on the undersides of the leaves.

To reduce this disease control aphids as quickly as possible. Aphids carry the virus and transfer it to the plants. (See page 26).

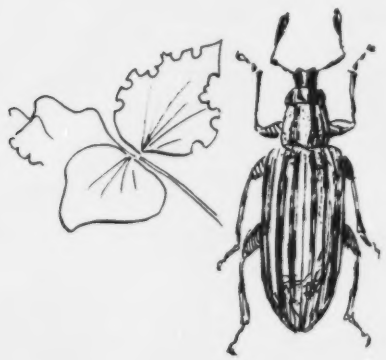
Use resistant pea varieties: Oregon Sugarpod II, Corvallis or OSU 604. Check your seed catalogue or contact your local B.C. Ministry of Agriculture and Food office for seed sources.

Pea Leaf Weevil

Prevalent on Lower Mainland and Vancouver Island only.

The leaves on young pea plants appear ragged with semi-circular and irregular pieces chewed out of the leaf margins. Pea Leaf Weevils are about 3 mm long, grey, and active only at night. This weevil will damage broad bean plants too.

When notches out of the leaf margins are first observed, apply Malathion 4% D (according to label directions), thoroughly dusting the plants and surrounding soil. Repeat treatment when new leaves are damaged.



Pea leaf weevil and damaged leaf

DESCRIPTION	CONTROL
Powdery Mildew	
Leaves develop a white covering which may eventually become grey to black and cover the pods, vines and leaves.	Destroy vines as soon as crop is harvested. Disinfect poles and wires as for Bean Rust. Avoid locating late plantings close to early plantings.
Pea Weevil and Pea Moth	
Peas are eaten and pods damaged by small, greenish caterpillars or grubs about 3 mm long. Damage is not easily seen on the outside of the pod.	Use early peas which are usually not affected. Bury or compost all plant debris immediately after harvest if peas were infested with caterpillars or grubs. If pests were present the previous year, spray peas during or just after blossoming with: Malathion 50% EC at 2 mL/L of water; or Methoxychlor 25% EC at 7.5 mL/L of water. This will not harm bees because bees do not pollinate peas.
Root Rot	
Peas germinate, but roots rot and plant growth is limited or fails to develop. In the case of true wilt, plants may grow normally until just prior to harvest, when they wilt or dry off. This disease also affects sweet peas.	To prevent seed from carrying this disease, plant only seed which has been treated with a protective fungicide. To protect peas from root rot in the soil, do not plant peas continuously in the same location, and promptly destroy crop refuse in the fall by burning, composting or incorporating it into the soil. In soils where root rot has been a problem, plant early-maturing varieties.

PEPPERS

Aphids

See page 26.

Flea Beetles

See page 28.

POTATOES

Bacterial Ring Rot	
This disease is spread into the garden on infected seed pieces. Soon after the potatoes have bloomed the lower leaves may wilt with a slight rolling of the leaf margins upwards. Hot, dry weather favors rapid development of this disease. When the tuber is cut across, a creamy yellow to light brown rot shows in the vascular ring just beneath the skin. Externally, the skin cracks and later the entire centre of the tuber breaks down leaving only a thin, outer shell.	If bacterial ring rot is suspected contact your local B.C. Ministry of Agriculture and Food office. Plant B.C. certified seed potatoes. Dispose of plant refuse and infected tubers in the garbage. Disinfect storage areas with a 1:10 dilution of household bleach in water.

DESCRIPTION	CONTROL
Blackleg	
Dark brown or black discoloration develops at the stem base of potato plants and the stem end of the tubers. Individual stems of the whole plant may wilt. Cool wet soil, continuously planted with potatoes and poor storage conditions enhance this disease.	Remove crop debris and dispose of diseased tubers immediately. Use certified seed and rotate so that potatoes are not continually planted in the same spot.
Choice of Seed	
To achieve a worthwhile crop, seed tubers must be as problem-free as possible. Seed potatoes saved from crops grown in urban areas or selected from table potatoes in a supermarket are likely to be infected with one or more viruses or other diseases. Also table potatoes may have been treated with a sprout inhibitor.	In all but the most isolated areas, home gardeners should purchase new certified seed each year. Obtain your seed early and green sprout it by spreading the tubers out in a sunny window until planting time. Discard any tubers which show signs of decay or which do not sprout properly.
Colorado Potato Beetle	
Colorado potato beetle is not a problem in Coastal B.C. Beetles are yellow and black striped and about 1.3 cm long. Larvae are reddish orange, with two rows of black spots on each side. Foliage is eaten by both the beetle and the larvae which also will damage tomatoes. This pest occurs in the Kootenays, the Southern Okanagan and the Similkameen Valley.	Hand pick beetles and larvae from plants if they are not too numerous. Spray larger infestations with: Diazinon 12.5% EC at 6 mL/L of water; or Methoxychlor 25% EC at 7.5 mL/L of water; or Sevin 50% WP at 9 mL/L of water; or treat with Sevin 5% D according to label directions.

Colorado potato beetle and larva

Early Blight	
Circular, black spots appear on leaves. Under severe conditions defoliation may occur. In contrast to late blight, this disease is rarely seen in the coastal area and it does not normally cause a tuber rot.	In the Interior areas where this disease is a problem, avoid frequent overhead sprinkling; increase soil fertility; and clean up crop refuse after harvest.

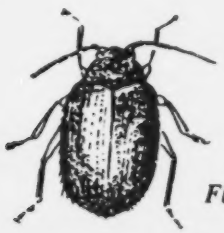
See Days to Harvest Table—Inside Back Cover.

DESCRIPTION	CONTROL
Hollow Heart	
Large tubers are most prone to hollow heart. When tubers are cut, they have irregular hollow areas in the centre. The cavity is usually outlined in brown and if the cracks extend to the surface the tubers rot.	Any condition, such as overfertilizing, that induces oversized tubers can cause hollow heart. Proper spacing, fertilizing and cultural methods will aid in avoiding this disorder.
Late Blight	
Look for brown spots on tips or margins of leaves and on stems. This disease causes dry or wet rot of tubers in the field and in storage.	Avoid excessive vegetative growth brought on by overfertilizing or overwatering. Do not crowd plants, nor plant in a shady spot. Where the disease appears, cut off and remove foliage about two weeks before harvesting. Harvest only in dry weather. Discard any infected tubers. Where past experience indicates that a spray program is required to avoid late blight, use at label rates: copper spray; or chlorothalonil;
Leaf Roll	
Leaves become rolled and stiff, starting from the bottom of the plant. Tubers from infected plants may develop a brown network just under the skin of the stem end (net necrosis).	To combat this virus disease, plant only certified seed. Rogue out obviously diseased plants that are stunted and have curled lower leaves. In areas where net necrosis occurs annually, avoid growing Netted Gem variety. Kennebec is tolerant to leaf roll.
Mosaic	
Leaves are mottled, sometimes becoming wrinkled and distorted.	To combat this virus, plant only certified seed. When only a few plants are affected, they may be rogued out.

Late blight of potato

DESCRIPTION	CONTROL
Rhizoctonia Disease	
Black scurf appears on tubers, and aerial tubers may appear on stems. The Netted Gem potato becomes excessively knobby.	Plant potatoes in newly turned sod, not old garden soil, or delay planting until soil is warm.
Scab	
Tubers develop round or oval corky spots, or roughening on skin surface.	Use certified seed to protect plants from seed-borne scab fungus. Control soil-borne scab by avoiding the use of lime, ashes or fresh manure on soil where potatoes will be grown. Russet varieties such as Netted Gem and Norgold Russet and the red variety Norland will be resistant to scab in most soils.
Silver Scurf	
Silver scurf is a fungus disease spread by infected seed pieces. Silvery blotches form on the tuber and considerable loss of colour may occur on red varieties. It is a problem when potatoes are stored in warm, moist conditions because sooty or smudgy spots and black lumps develop.	Prevent introduction of this disease by using only certified seed. Harvest tubers as soon as they mature and discard noticeably infected tubers at that time.
Tuber Flea Beetle	
Tuber flea beetles are small (3 mm), black, fast-jumping beetles that eat numerous small, round holes in the leaves causing a shot-hole effect. Beetle larvae feed in the tubers by tunnelling beneath the skin making thread-like tunnels that fill with corky brown tissue. Extensive tunnelling near the surface may resemble common scab.	If potatoes were damaged in the previous year, treat plants when beetles or feeding damage on the leaves first appear. For good control, upper and lower surfaces of the leaves should be treated with insecticide. Use: Methoxychlor 25% EC at 6 mL/L of water; or Sevin 50% WP at 9 mL/L of water. Repeat this treatment when holes appear in new leaves or when beetles reappear.

Potato scab



Flea beetle

See Days to Harvest Table—Inside Back Cover.

DESCRIPTION CONTROL

RADISHES

Cabbage Maggot

See description and illustration, page 34.

See cabbage maggot cultural control methods page 34.

Apply Diazinon 5% G at 23 mL/10 m of row in furrow with seed (some loss of seedlings may occur with this treatment);

or drench 5 cm of soil on each side of the row with Diazinon 12.5% EC at 3 mL/L of water when half the seedlings have emerged. Repeat this treatment in 15 days.

Flea Beetle

See page 28.

TOMATOES

Fruit Rot

Dark lesions appear on leaves in wet weather. Various spots and rot develop on fruit.

Grow early-maturing varieties, and avoid wetting foliage late in the season. Staked varieties will have less fruit rot. Mulching is beneficial.

Apply fungicide sprays from early August until the first frost. Use:

a Copper Spray (49–53% active) at 9 mL/L of water;

or chlorothalonil at label recommendations.

Blossom-end Rot

The blossom end of the tomato fruit develops a circular dead spot up to 2.8 cm in diameter.

This condition is not caused by a disease organism. It is caused by a lack of calcium and uneven moisture supply during growth.

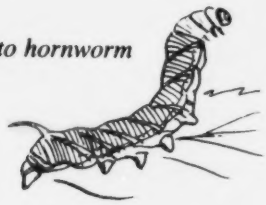
Maintain a fairly high calcium level in the soil by incorporating agricultural lime at the rate of 1 to 2 kg/10 m^2 prior to planting. Provide uniform soil moisture throughout the growing season; mulching helps in this respect.

To prevent this problem in developing fruits, spray with:

calcium chloride at 6 mL/L of water. Apply two or more sprays at weekly intervals. Do not use a more concentrated solution, as injury to leaf margins may occur.

Blossom end rot of tomato

DESCRIPTION	CONTROL
Cutworms, Tomato Fruitworm and other Caterpillars These worms are usually grey, brown, or green, and up to 4 cm long. Holes up to 6 mm deep appear in unripe tomato fruits. Cutworms feed at night at or below ground level or they may climb and feed on aerial portions of the plant. During the day they are found in soil under clods near attacked plants. Freshly transplanted succulent plants are especially susceptible.	Keep a close watch on plants. If damage appears, remove worms by hand at night by using a flashlight. If the infestation is severe, spray plants and fruit with: Sevin 50% WP at 9 mL/L of water; or Thuricide at 1 mL/L. For cutworm control see page 27.
 Cutworm	
Early Blight Leaf spots are dark brown to black with concentric markings. Black spots on stems and large, black, leathery sunken areas on the fruit develop. Losses due to blight and fruit rot occur in late summer and early fall when wet weather begins. This disease is common in the Interior of B.C.	See Late Blight for control measures.
Flea Beetles See page 28. Young plants early in the season are especially susceptible.	
Late Blight Irregular greenish-black, water-soaked blotches appear on older leaves. Brown cankers form on stems and greenish-brown spots develop on fruit. Cool, wet weather is ideal for this disease which also affects potatoes.	Avoid late blight by growing early-maturing varieties, avoid wetting the foliage when watering, adequately space the plants and do not over-fertilize. Where past experience indicates that a spray program is required to avoid late blight, apply one of the following at label rates every 10 to 14 days beginning in mid-July. Copper spray (49–53% active) or chlorothalonil.

DESCRIPTION	CONTROL
Leaf Roll	
Plants are stunted; leaves roll up and become brittle. Some varieties are much more susceptible than others.	Tomato leaf roll may be caused by potato leaf roll virus which spreads from infected potato plants late in the season. To control this type of leaf roll, grow tomatoes at some distance from potatoes. This disease can also be caused by unsatisfactory growing conditions. The degree of rolling can be reduced by improving soil fertility and ensuring that adequate moisture is available at all times. Mulching will help to achieve this.
Tomato Hornworm	
Foliage and fruit is eaten by large, 5 cm long, green worms with a short, red horn at the end. *Tomato hornworm* 	Destroy worms by hand picking them from plants. If hornworms are present in large numbers, plants may be sprayed with: Thuricide at 1 mL/L. or Sevin 50% WP at 9 ml/L of water.
Whiteflies	
These small, delicate, white insects suck plant sap and are usually found on the undersurface of leaves or fluttering about plants. Leaf surfaces are covered with sticky honeydew excreted by these insects. Leaves become pale or discoloured, and may turn black due to the growth of sooty mold. (See page 25.)	Use yellow painted 15 cm^2 cardboard coated with #90 oil as sticky traps among plants. Do not allow boards to contact leaves. If that is not satisfactory, spray with: Diazinon 12.5% EC at 6 mL/L of water; or Malathion 50% EC at 2 mL/L of water; or burn a Raid coil in small greenhouses; or Safer's Insecticidal Soap at 20 mL/L of water; Repeat at 4-day intervals, seven times.

TURNIPS

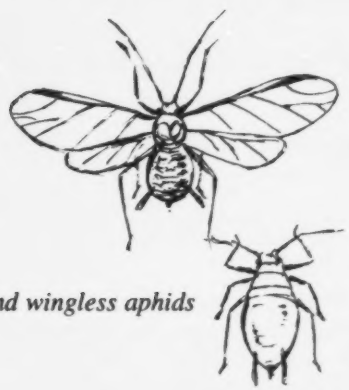
Turnip Maggot and Cabbage Maggot	
Turnip Roots are tunnelled and etched on the root surface. This damage may later cause root rot or calloused roots. Damage is done by white maggots which are up to 6 mm long. See illustration and description, page 34.	See cabbage maggot (page 34) for cultural control methods. Turnip maggot and cabbage maggot are very difficult to control. If damage occurred the previous year, apply: Diazinon 5% G at 14mL/10 m of row in furrow with seed. (Some loss of seedlings may occur with this treatment.) Twenty-eight days later, drench 7.5 cm of soil around plants with: Diazinon 12.5% EC at 3 mL/L of water. Use 1.5 L of mixed spray per 10 m of row. Repeat this treatment every 10 to 14 days until three weeks before harvest.

COMMON INSECTS AND DISEASES OF FRUIT TREES

Note

Legislation and by-laws in the Interior fruit-growing regions require that pests on fruit-trees in home gardens be controlled. Unsprayed trees are a source of infection and infestation for commercial orchards.

DESCRIPTION	CONTROL
Algae, Lichens and Moss	
Green and variously coloured growths may be found on twigs, limbs and trunks of many trees and shrubs. The growths may be leaf-like, hairy or scale-like.	Annual dormant sprays with lime sulphur and oil will prevent the establishment of these growths. Once established, however, they must be scraped off with a wire brush or stiff scrub brush before or in conjunction with spraying. Apply copper spray at 6 mL/L of water and use a spreader sticker. or lime sulphur 120 mL/L of water during dormant period. (Do not use lime sulphur spray on apricots or filberts.) or Safer's DE-MOSS Cryptocidal soap according to label directions.
Aphids	
These insects cause leaves to curl, and swelling on twigs. They are small, soft-bodied, sap-sucking insects found on the undersides of leaves or on twigs. Aphids are pear-shaped, 2–3 mm long and can be winged or wingless. If present on twigs, aphids will be covered with a cottony white substance in clusters or colonies. Aphids transmit many diseases caused by viruses.	Aphids are usually not a problem on mature trees except on pruning wounds. If aphids were present the previous year, check trees before spraying to see if predators such as lady beetles and lacewings have the situation under control. (See page 106). If these predators are not present, spray trees with: Diazinon 12.5% EC at 6 mL/L of water; or Malathion 50% EC at 2 mL/L of water; or Safer's Insecticidal Soap at 20 mL/L of water.



Winged and wingless aphids

See Days to Harvest Table—Inside Back Cover

DESCRIPTION

Bruce Spanworm and Winter Moth

The Winter Moth is a major problem on southern Vancouver Island.

They attack apple, maple, poplar, and many other trees and shrubs.

Beginning in early spring to late May or early June, worms feed on the leaves and buds. Defoliation occurs when infestations are severe.

Young worms are carried on the wind and can drift considerable distances on silken threads, so protected trees can become infested from neglected trees in the neighbourhood.

The male moths are pale brownish-grey with a wing span of about 3.2 cm. The females are wingless.

The full grown larvae or worms are about 2 cm long. They are bright green with three narrow, whitish stripes on each side of the body.

Spanworm larva

CONTROL

Two sticky bands 15 cm wide, applied 30 and 60 cm above ground around the tree trunk in late October will trap many of the females as they crawl upward to deposit eggs on the trunk and larger limbs. The lower band should be replaced when it becomes dry, filled with moths or debris, or when moths begin to be trapped on the upper band. All bands can be removed and burned the following spring.

For additional control apply a spray in spring when apple blossom buds on trees in the area are in the pre-pink stage, or approximately mid-April for southern Vancouver Island.

Use a second spray immediately after apple blossom time where infestations are heavy or where re-infestation occurs from nearby neglected trees.

Treat with:

Methoxychlor 25% EC at 0.5 mL/L plus Safer's Insecticidal Soap at 15mL/L of water;

or Methoxychlor 25% EC at 4 mL/L.

Caterpillars and Skeletonizers

These pests attack a wide range of plants. Some feed from within rolled leaves, others skeletonize leaf surfaces or form webs. Damage may occur throughout the growing season.

Species such as the eye-spotted bud moth may hatch and feed early in the spring when leaves are just starting to unfold.

Young caterpillars may be dispersed on silken webs by the wind. Mature caterpillars are up to 2.5 cm long.

Watch plants for signs of feeding damage due to caterpillars and skeletonizers.

For small infestations, remove caterpillars by hand picking, or pruning and burning.

Large infestations may be treated with:

Diazinon 12.5% EC at 6 mL/L of water;

or Methoxychlor 25% EC at 4 mL/L of water.

Treat when leaves are unfolding for species such as the eye-spotted bud moth.

Fruit tree leafroller control requires a pre-pink and post bloom spray. See page 53.

DESCRIPTION

CONTROL

Leafhoppers

Leaves become speckled and pale due to leafhopper damage.

Leafhoppers are small (up to 6 mm long), slender, sap-sucking insects which feed on the undersides of leaves. They are usually pale green, white, yellow, or green and move rapidly when disturbed. Some species have a second generation about August or September. Immature leafhoppers are wingless, while the adults can fly.

Most species of leafhopper appear by mid-May. If numerous, spray with:

Diazinon 12.5% EC at 6 mL/L of water;

or Malathion 50% EC at 2 mL/L of water.

Mature *Immature*

Leafhoppers

Mites

Mites are tiny spider-like animals, barely visible without magnification.

Mites cause the following symptoms on trees.

(a) *Blister Mites*

Small, pale blisters appear on the undersides of young leaves, and later turn brown. Fruit may become russeted. This pest is a problem mainly on pears.

If blister mites were present in the previous growing season, treat trees in the dormant stage with lime sulphur at 100 mL/L of water.

(b) *Rust mites*

Leaves appear dry and rusty or silvery and tend to roll upwards around the midrib. Young leaves may turn yellow. Trees suffer loss of vigour.

Treatment is not usually necessary for rust mites. If infestation is severe, treat trees when they are dormant with lime sulphur as recommended for blister mites, or apply a foliar spray as recommended for control of spider mites.

(c) *Spider mites*

The foliage becomes mottled and then takes on a bronzed appearance. Leaves may crinkle or become densely webbed.

Spider mites can be controlled by treating when damage first appears with:

Kelthane 18.5% EC or WP at label rates. Use applications 10 days apart.

or Safer's Insecticidal Soap at 20 mL/L of water.

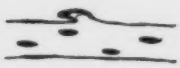
If spider mites were a problem the previous year, apply dormant spray oil at the 12 mm green stage as per label directions.

Spider mite

DESCRIPTION	CONTROL
Powdery Mildew	
Look for greyish-white, mouldy growth on the surface of shoots, foliage and blossoms. This disease causes russeting of fruit.	In most home gardens the control of this disease is rarely worth the effort. Plant resistant varieties. If further control is necessary, spray at the pink-bud stage with: Benlate 50% WP at 3 mL/L of water; or Sulphur 65% WP at 12 mL/L. Repeat this treatment every 10 to 14 days.
Scale Insects (a) *Lecanium Scales* Look for 2 to 5 mm hemispherical wrinkled "bumps" or scales on small limbs and twigs. Twigs heavily infested with scale can die back.	Apply: Dormant oil at 25–50 mL/L of water in the late winter or early spring up to pre-pink stage of bud development. (This treatment will also kill over-wintering insects on trees.) or spray during August with: Malathion 50% EC at 2 mL/L of water; or Diazinon 12.5% EC at 6 mL/L of water.

Scales

Mature scales

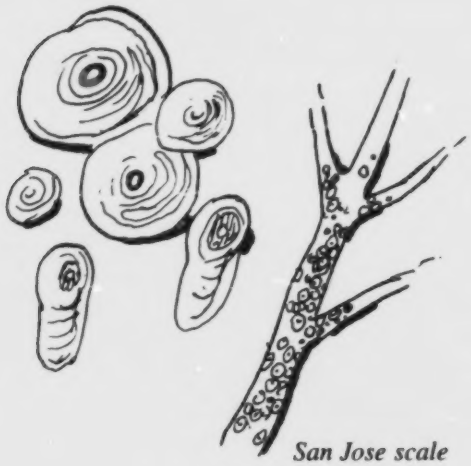


Immature over-wintering scales

(b) *Oystershell Scale* Look for small scales 3 mm, shaped somewhat like an oyster shell. Heavy infestations will retard tree growth and reduce vigour.	Scraping the scales off the trunk and main limbs with a wire brush will reduce the number of scales. Spray during the last week of May and again three weeks later while the immature mobile stage is present. Use: Diazinon 12.5% EC at 6 mL/L of water and wet thoroughly to point of run-off.

Oystershell scale

DESCRIPTION	CONTROL
(c) *San Jose Scale and European Fruit Scale* Look for small, stationary, rounded "bumps" or scales 2 mm in diameter on the surface of limbs and twigs. These peculiar insects reduce tree vigour, and if present in large numbers may kill the tree.	If this pest was present in previous years, spray when trees are in the dormant stage with dormant spray oil at: 25–50 mL/L of water; spray thoroughly to point of run-off.



San Jose scale

Shothole Borer, Bark Beetle and Ambrosia Beetle

Trees with poor growth or newly planted trees under stress are most often attacked. The trees appear wilted, and numerous small holes 2 to 3 mm in diameter appear on the trunk and larger limbs. Beetles are brown and about 2 mm long.	Prune out dead and dying limbs and burn immediately. Infested wood left in a pile breeds insects. Irrigate and fertilize sound trees to encourage vigorous growth.

APPLES AND PEARS

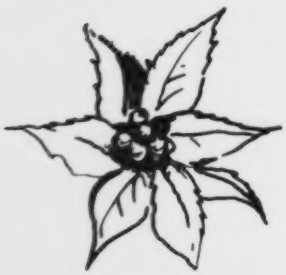
Stages of bud development

Dormant

Silver tip

Green tip

Half-inch green



Tight cluster

First pink

DESCRIPTION

CONTROL

Ambrosia Beetle

See page 50.

Anthracnose Canker

Infections occur with fall rains.

Damage first appears as small, reddish-brown spots on the bark of small apple branches and twigs, and sometimes on the trunk and large limbs of young trees. The next year, the spots develop into well-marked cracks on the twig, and then into sunken and shrivelled cankers.

Anthracnose

Top: Spots and cracks on twig

Bottom: Canker on twig

Young McIntosh and Transparent trees are very susceptible to this disease.

In March, prune out and burn infected twigs. If scab sprays are not applied, spray the infected trees with:

Zerlate 75% WP at 4 mL/L of water. After harvest but before rains begin, spray again with:

Zerlate 75% WP, or a copper spray (49–53% active) at 6 mL/L of water.

DESCRIPTION

CONTROL

Apple Sawfly

This insect is a problem only on Vancouver Island.

First, a small, serpentine callus appears on young apples. Next, holes in the fruit develop with a black substance protruding. This injury causes immature fruit to fall from the tree.

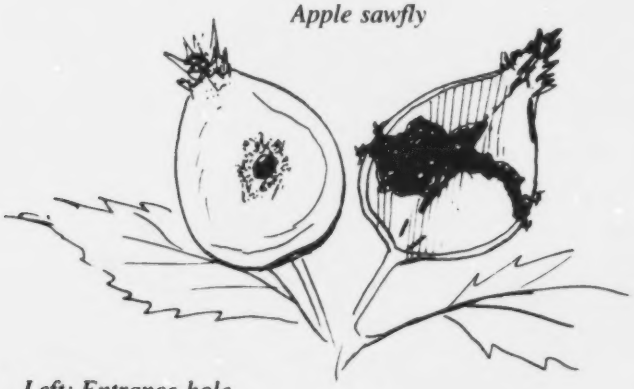
The apple sawfly larva is a greenish worm up to 12 mm long that feeds inside fruit.

If damage was seen the previous year, spray trees one week after petal fall with:

Diazinon 12.5% EC at 6 mL/L of water;
or Methoxychlor 25% EC at 4 mL/L of water.

Repeat this treatment seven days later.

Apple sawfly



Left: Entrance hole

Right: Young apple cut open to show damage

Apple Woolly Aphid

In British Columbia, this aphid overwinters in sheltered places on the tree, such as the base of water sprouts or under dead bark around nodular swellings, and may lead to winter-killing of the tissues. The perennial canker fungus attacks these injured tissues. The presence of this aphid is recognized by cottony-white masses around pruning cuts, water sprouts and leaf axils. The aphids beneath the cottony material are purplish-brown in colour.

Spray trunk and branches thoroughly with:

Diazinon 12.5% EC at 6 mL/L of water;
or Malathion 50% EC at 2 mL/L of water;
or Safer's Insecticidal Soap at 20 mL/L of water.

Codling Moth

Codling moth larvae are pink and up to 12 mm long. They burrow into apples and feed inside the fruit. A dark substance is produced from the entrance holes.

This pest may be present at harvest time. There are several generations per year.

A number of spray applications are required to control this pest. The first spray should be applied one week after petal fall. Use:

Diazinon 12.5% EC at 6 mL/L of water;
or Imidan 50% WP at 4 mL/L of water;
or Methoxychlor 25% EC at 4 mL/L of water.

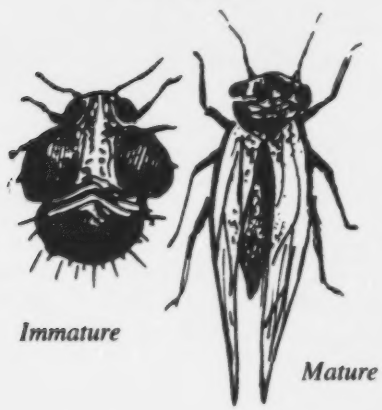
Repeat this treatment twice at two-week intervals, and again in the first week of August.

DESCRIPTION	CONTROL
European Canker	
Infection occurs with the fall rains as the leaves are dropping. Cankers girdle twigs and shoots, and occasionally kill larger limbs. This disease is most troublesome in moist coastal areas.	Transparent and Northern Spy apple trees are resistant to European canker, although they are susceptible to Anthracnose canker. At the beginning and end of leaf fall, apply either: Copper spray (49–53% active) at 6 mL/L of water; or Zerlate 75% WP at 3 mL/L of water. Spray susceptible varieties such as McIntosh, Spartan and Gravenstein twice, other varieties once. For larger cankers, cut away dead areas and paint with a 50:50 solution of Zerlate 75% WP and boiled linseed oil. Small limbs with cankers can be pruned off and burned.

European canker

Leafrollers	
Look for green worms up to 12 mm long with brown or black heads hiding in rolled leaves. They are present at apple blossom time and later.	Spray just after petal fall and again in July with the same insecticides as for codling moth above.
Pear Psylla	**Dormant season**
Pear foliage develops brown spots. Leaves and fruit become covered with honeydew, which blackens the foliage and fruit. Small, yellow to brown insects appear. Mature forms are winged, immature forms are wingless.	About one month before anticipated bud-break apply: Volck dormant oil at 7 mL/L, plus lime sulphur at 100 mL/L of water. This treatment will control adult psyllids that have migrated to the pear trees. **Early growing season** During pink bud stage, but before any blossoms have opened, apply: Diazinon 12.5% EC at 6 mL/L of water; or Imidan 50% WP at 4 mL/L of water. Do not spray during blossom time in order to avoid killing pollinating insects. In summer, apply: Safer's Insecticidal Soap at 10 mL/L. Regular spraying with water will remove accumulated honeydew.

Pear psylla



Immature *Mature*

See Days to Harvest Table—Inside Back Cover.

DESCRIPTION

CONTROL

Pearslug

Pear leaves become skeletonized. Later, damaged areas turn brown.

Slimy slug-like worms, up to 7 mm long, green to black in colour, are present on pear leaves.

Damaged pear leaf with pearslugs

In the spring, examine trees closely for damage. If it warrants control, spray with:

Diazinon 12.5% EC at 6 mL/L of water;

or Methoxychlor 25% EC at 4 mL/L of water,

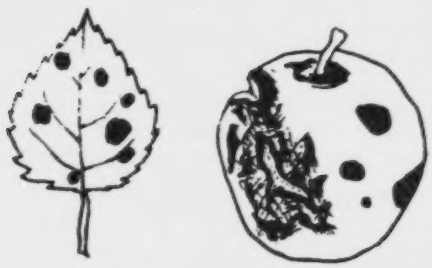
or Safer's Insecticidal Soap according to label directions.

Scab (Apple and Pear)

Sooty spots appear on leaves and fruit.

Early fruit infections consist of small, black or olive coloured spots which become corky and brown after cracking and distorting the fruit.

Scab



Scab on leaf *Scab on apple*

This disease is a perennial problem with some varieties. When planting new trees, avoid McIntosh, Gravenstein and other highly susceptible strains. Spartan apples and Bartlett pears are quite resistant.

To assist in destroying the overwintering fungus on leaves, rake up and destroy leaves shortly after leaf fall each year. If additional control is required apply:

Benlate 50% WP at 2 mL/L of water after harvest and before leaf drop (coastal area).

FOR PEAR TREES: Lime sulphur applied to pear twigs in the dormant stage will also reduce the overwintering inoculum.

FOR APPLE AND PEAR TREES: When trees are in the pink-bud stage, spray with:

Captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations. The interval between last application and harvest is seven days;

or Cyprex 65% WP at 1.5 mL/L of water;

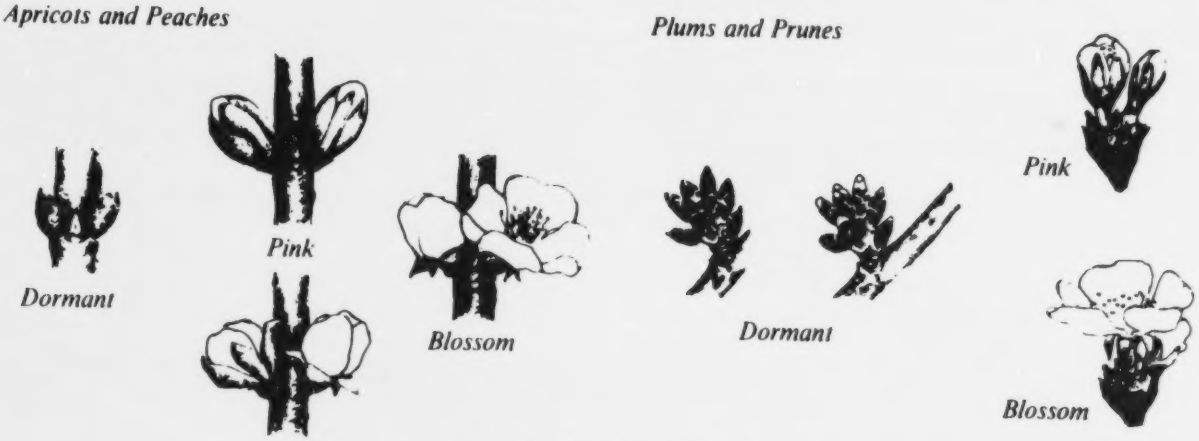
or Easout 70% WP at 1.5 mL/L of water.

Repeat this spray one week after petal fall, and again five weeks later.

PEACHES, APRICOTS, PRUNES, PLUMS AND CHERRIES

Apricots and Peaches

Plums and Prunes



Stages of bud development

DESCRIPTION

CONTROL

Bacterial Canker or Gumming

Young cherry, peach and apricot trees are most susceptible to bacterial canker or gumming. Prominent blossom and twig killing occurs in the spring, often accompanied by gumming. Gummy trunk and limb cankers may kill all or part of the young trees later in the season.

Prune out as many cankers as possible well below the diseased area.

Disinfect pruning tools after each cut in a solution of 1 part Phenol-based Lysol to 10 parts of water. This will prevent spreading the disease.

Applications of a copper spray (49–53% active) at 6 mL/L of water, may be applied at leaf drop and again in January. This will also help to control Coryneum blight and peach leaf curl.

Bacterial canker

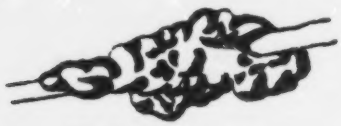
Black Knot

These wart-like growths appear on the twigs and branches of plums and prunes. Early growths are soft and greenish, and most abundant on small twigs, though severe infections may affect larger limbs. The warts enlarge with the tree's growth reaching a diameter of 15 to 20 cm. As they grow they become black and hard.

Any knots seen should be pruned out and burned before March 1st each year. Knots on larger limbs can be cut out by removing the diseased areas and 7.5 cm above and below the swelling down to the inner wood.

Spray infected trees with lime sulphur at 100 mL/L of water at the dormant stage.

Apply another spray of lime sulphur at 20 mL/L of water at full bloom and petal fall.



Black knot

DESCRIPTION

CONTROL

Black Cherry Fruit Fly and Western Cherry Fruit Fly

Not prevalent on the Lower Mainland.

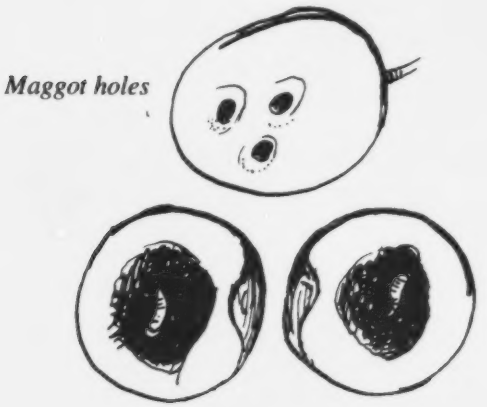
White, legless maggots, 3 mm long, feed around the stone in semi-ripe to ripe cherries. Mature maggots cut one or more holes through the outer skin three or four days before emerging from fruit.

When first blush of pink colour appears on fruit, spray with:

dimethoate 2E at 2mL/L of water;
or dimethoate 4E at 1 mL/L of water.

Thorough coverage of tree foliage is important for good control.

This spray is also effective against black cherry aphid and cherry and pearslug.



Cherry fruit fly damage

Brown Rot

The first sign of brown rot infection on flowering and fruiting cherries and other stone fruits is seen after blossoming in the spring. Clusters of blossoms stick on the tree and a grey mould develops on them. Subsequently leaves turn red on scattered branches throughout the tree.

On fruiting varieties, the next symptom is seen when the fruit approaches maturity. Infected fruits develop a tan coloured rot which may spread to adjacent fruits.

Mummified fruit and blighted twigs should be removed from the tree and destroyed during pruning.

Spray trees at the pink-bud stage with:

Benomyl 50% WP at 1mL/L of water;
or Captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations. The interval between last application and harvest is seven days.

Repeat this treatment at full bloom if it rains during blooming, and again if it rains when the fruit is ripening.

Cherry Leaf Curl and Witches'-broom

Broom-like tufts develop on branches. Leaves are thick and reddish with a white covering on the under surface of leaf.

Once a branch has become infected it will remain so. Trace broom to where it grows from a normal branch; prune at least 30 cm below that point. In severe cases a spray program as for peach leaf curl (see page 57) may be required.

See Days to Harvest Table—Inside Back Cover.

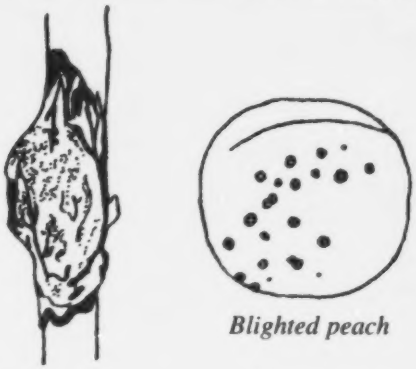
DESCRIPTION

CONTROL

Coryneum Blight

Peaches develop small, dark, glazed cankers on twigs and branches. Leaves become covered with small holes; fruit is covered with small, red spots.

Apricots develop numerous, small to medium, scabby, reddish spots on fruit. Leaves become covered with small holes. Limb cankers occasionally develop.



Blighted peach

Blighted twig

Coryneum blight

In September before the fall rains start, spray peaches and apricots at least once with a copper spray (49–53% active) at 6 mL/L of water.

During the dormant stage, prune out cankers on twigs and branches.

In the spring, spray at husk-fall stage with:

Captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations. The interval between last application and harvest is seven days.

or Ziram 50% at 3 mL/L of water.

These materials may discolour apricots.

Peach Leaf Curl

In the spring, peach leaves become thick, curled, and discoloured. They eventually drop from the tree.

Peach leaf curl

Renton variety is partially resistant.

Trees planted in areas protected from rain, such as under eaves of a building, will not become infected.

If trees were infected the previous year, spray trees in the dormant stage (September to January) with:

a copper spray (49–53% active) at 6 mL/L of water;

or Difolatan 4.8F at 3 mL/L of water (available in commercial sizes only);

or Fermate 76% WP at 6 mL/L of water;

or lime sulphur at 100mL/L of water;

or Ziram 50% WP at 6 mL/L of water.

Complete coverage with a high pressure sprayer is essential for good control.

If the spray is applied in September, it will also help to control Coryneum blight.

DESCRIPTION

Peach tree Borer

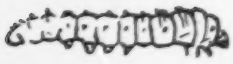
This pest attacks peaches and several other stone fruit trees. Look for gumming at the base of the tree. Young trees may be girdled and die; older trees may be seriously weakened.

Damage is caused by cream-coloured, brown-headed larvae up to 2.5 cm long. The larvae feed on inner bark at the soil surface or just below. Adults are clear-winged moths.

Peach tree borer

Adult female

Adult male



Larva

CONTROL

Dig out borers with a sharp knife, or probe out with a flexible wire.

It is helpful to drench the base of the tree in July and August with:

Diazinon 12.5% EC at 6 mL/L of water.

Peach Twig Borer

Young trees are particularly susceptible to peach twig borer which causes wilting and die back of terminal twigs of peach, apricot, plum and prune in the early spring.

Injury is done by dark-brown segmented larvae up to 12 mm long.

In the spring, peach twig borers burrow into the tender terminal twigs. In the summer, the larvae feed by burrowing into the stem end of developing fruit.

Peach twig borer

Prune and burn damaged limbs. Burn all infested fruit. If this pest was present in previous years, spray at the pink bud stage with:

Diazinon 12.5% EC at 6 mL/L of water.

Repeat this spray at petal fall and again in the third week of June.

DESCRIPTION

Pearslug

Cherry leaves become skeletonized and turn brown.

This pest is a dark green to black, slimy, slug-like worm, up to 6 mm long.

Damaged pear leaf with pear slugs

CONTROL

Spray with:

Diazinon 12.5% EC at 6 mL/L of water;
or Methoxychlor 25% at 4 mL/L of water
or Safer's Insecticidal Soap according to label directions.

COMMON INSECTS AND DISEASES OF BERRIES AND GRAPES

DESCRIPTION

CONTROL

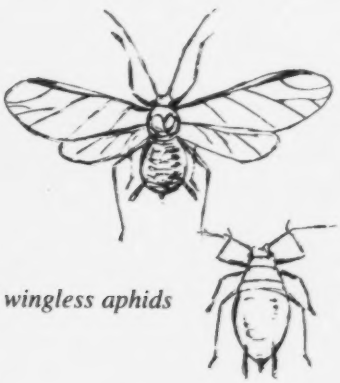
Aphids

These pests attack many kinds of plants. Aphids cause leaves to curl and twist.

Look for small, soft-bodied, sap-sucking insects that vary in colour from pinkish, white, to green and black.

Aphids are often found in clusters or colonies on stems and the undersides of leaves. They may be winged or wingless.

Aphids transmit many plant diseases caused by viruses.



Winged and wingless aphids

These insects are best controlled when colonies are small, and before plant leaves start to curl.

In some instances, it may be possible to remove aphids by frequently spraying the plant with water.

Do not use an insecticidal spray if large numbers of predators such as lady beetles and lacewings are present. (See page 106)

Plants may be treated with:

Safer's Insecticidal Soap at 20 mL/L of water;

or Malathion 50% EC at 2 mL/L of water.

or Diazinon 12.5% EC at 6 mL/L of water.

Cutworms

These worms attack many different types of plants. In the early spring, look for stems, shoots and buds that are damaged.

Cutworms are striped, spotted caterpillars which climb up plants to feed at night, and rest in the soil at the base of plants during the day. They are up to 3 cm long.

Remove cutworms from plants by hand in the late evening, or destroy those found around the base of the plants during the day.

Apply Diazinon 5% G around the base of plants and work into the top 2.5 cm of soil;

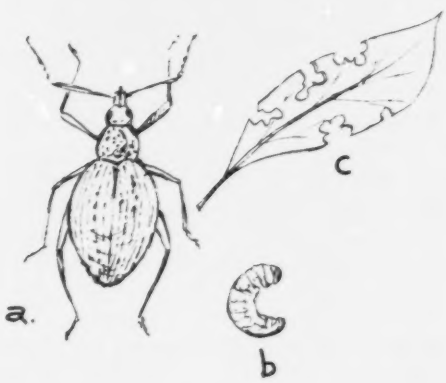
or spray with Sevin 50% WP at 6 mL/L of water;

or apply cutworm bait. (See page 27)

Cutworm

See Days to Harvest Table—Inside Back Cover.

DESCRIPTION	CONTROL
Leafhoppers	
Leaves become stippled and pale. Leafhoppers are small (up to 5 mm long), slender, sap-sucking insects, usually pale green, white or yellow, and jump when disturbed. They feed on the undersides of leaves. Some species have a second generation about August or September. See illustration page 48.	Leafhoppers generally appear by mid-May. If numerous, spray with: Diazinon 12.5% EC at 6 mL/L of water; or Malathion 50% EC at 1 mL/L of water.
Powdery Mildew	
During the growing season, leaves appear mottled and white, powdery material appears on leaves, shoots and fruit. Dormant grape vines show blotchy red wood.	See specific crop.
Root and Vine Weevils	
These nocturnal pests attack many types of berry and ornamental plants. Vine weevils feed on grape bunches causing grapes to drop off. Root weevil larvae or grubs feed on roots, seriously weakening plants or causing them to die. The snout-nosed beetle feeds on the edges of leaves giving them a notched appearance. There are 5 or 6 species ranging in size from 3 to 10 mm; and in colour from grey to black.	Partial control of adult weevils is possible by placing short pieces of boards among plants. Weevils hide under these and can be collected and destroyed every few days. Weevils (other than Black Vine Weevil) can be controlled by placing small amounts of weevil bait containing 5% sodium fluosilicate around the base of plants. The bait must be formulated with apple pomace to be effective. Rainfall or irrigation will reduce the effectiveness of the bait. Repeat the application of bait in 10 days or when more leaf-notching appears; or when fresh leaf-notching appears, spray with: Malathion 50% EC at 2 mL/L of water; these sprays give only partial control. Malathion is more effective above 20°C than below 20°C.

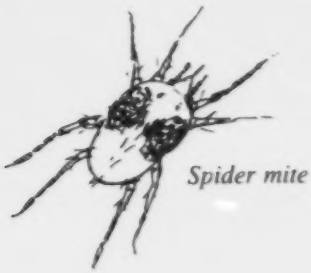


Root weevil

(a) adult (b) larva (c) leaf notching

See Days to Harvest Table—Inside Back Cover.

DESCRIPTION	CONTROL
Spider Mites Look for browning or russeting of foliage, sometimes accompanied by extensive webbing. Mite damage occurs most often during hot, dry weather. Look for very small, spider-like creatures almost invisible without magnification. Use a hand lense of at least 10 × magnification to examine undersides of leaves for the presence of mites.	Spray affected plants with: Kelthane 18.5% EC or WP at label rates; or Malathion 50% EC at 2 mL/L of water; or Safer's Insecticidal Soap at 20 mL/L of water.



Spider mite

BLUEBERRIES

Godronia Canker Canes die during the summer becoming conspicuous "flags" of red leaves. Dead canes are reddish brown at tips and greyish white at the base.	Do not plant Berkeley, Jersey or Pemberton varieties. Rancocas and Rubel are resistant. Remove and destroy any dead canes or the fungus continues to sporulate on them and infects other canes.
Leafrollers and other Caterpillars These caterpillars damage blossoms and fruit. Some species feed within rolled leaves or web leaves together. Look for small caterpillars of various colours up to 1 cm long.	When damage occurs to blossoms or berries, spray with: Malathion 50% EC at 2 mL/L of water; or Thuricide at 1 mL/L of water.
Mummy Berry Blossoms and leaf clusters are blighted. Berries turn a tan colour and fall to the ground.	Destroy mummified berries on the ground before spring, and keep the area under the bushes clean.

See Days to Harvest Table—Inside Back Cover.

DESCRIPTION

CONTROL

GRAPES

Birds

Robins, starlings, blackbirds, and magpies feed on grapes when they begin to ripen and thereafter.

The most practical control is to use netting to exclude the birds. This method keeps the birds feeding on wild berries and insects.

Powdery mildew

Conditions most favourable for powdery mildew occur in seasons when there is warm spring weather.

Powdery mildew is a fungus disease that attacks the fruit, shoots and leaves of the grape vine. The fungus overwinters on fallen leaves on the soil or in the buds and bud scales. As growth starts in the spring, the fungus becomes active, infecting new foliage and shoots. The infection is usually not noticeable at this time. Later in the season, these infections turn grayish and finally appear as reddish-brown areas on dormant canes.

Leaf infections show whitish or greenish-white patches and have a mottled appearance.

Infected blossoms may fail to set fruit.

Infected berries may crack open and dry up or never ripen at all.

Shaded and sheltered locations favour mildew development.

Control

1. Select varieties that are resistant to mildew;
2. Drain wet areas in the vineyard around vines;
3. Prune the vines to spread them over the entire trellis;
4. Plant to permit good air drainage and allowing as much sun penetration as possible.
5. Trim heavy foliage to increase air circulation. Leave at least six leaves beyond the last cluster on trimmed shoots.
6. Apply:
   Benomyl 50% WP at 1 mL/L of water;
   or Sulphur 65% WP at 3 mL/L of water.
   Begin application when new growth is 5–10 cm long and repeat up to 5 times during the season until fruit begins to soften and colour.

Do not apply sulphur to Concord, Sheridan or Foch.

Fruit and leaf "burning" may occur if sulphur is applied during slow drying conditions or when temperatures are over 27°C.

Thrips

Thrips are small insects (2 mm), usually found in association with flowers. In vineyards, thrips over-winter in the leaf litter as mature females. Early in the spring, thrips develop on weeds and later move up to feed on grape foliage. Thrips damage to shoots and leaves can result in severe reduction of leaf size and may also reduce internode length. Thrips feeding on very young berries following fruit set cause scars or russeting on the skin as the berries increase in size. Odd-shaped or split berries may result.

Thrips are more of a problem in the Oliver-Osoyoos area.

(See illustration page 25).

Apply: Diazinon 12.5% EC at 6 mL/L of water;
or Malathion 50% EC at 2 mL/L of water, right after blossoming and repeat later in the season when thrips again become numerous.

DESCRIPTION CONTROL

CURRANTS AND GOOSEBERRIES

Currant Borer

Weak canes with yellowish foliage develop in the spring, dying two to three weeks later. Dead canes are tunnelled by a whitish worm with a brown head.

Cut out dead wood in the fall, and prune and burn infested canes in the spring.

Currant Fruit Fly

This pest attacks currants and gooseberries.

Some infested berries will drop prematurely, others will remain until harvest.

Small flies, half as large as house flies, are present at and just after bloom, and white, legless maggots feed within the berries.

If fruit was infested with maggots the previous year, treat in the spring with two sprays of:

Methoxychlor 25% at 6 mL/L of water;
or Malathion 50% at 2 mL/L of water.

Apply the first spray 10 days after blossoming starts, repeat twice at weekly intervals. Spray in late evening to avoid killing bees which are necessary for pollution.

Currant Sawfly

Foliage is eaten by a greenish, smooth, caterpillar-like worm up to 12 mm long with black spots. The entire bush may be defoliated.

Worms usually appear during the last half of May, and prefer the inner parts of the bush.

Remove worms by hand picking or spray bushes with:

Methoxychlor 25% EC at 6 mL/L of water.

Currant sawfly larva on damaged leaf

RASPBERRIES, LOGANBERRIES, AND BLACKBERRIES

Fruit Rot

Look for soft, rotted fruit which later become covered with gray mould.

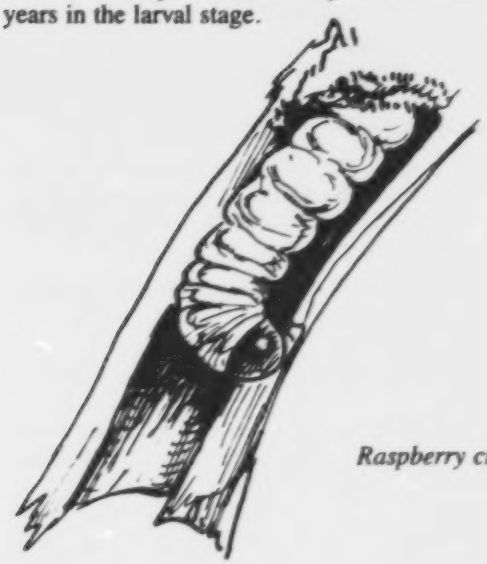
Avoid excessive leaf growth by limiting nitrogen fertilizer application. When watering close to or during harvest, avoid wetting the leaves. A spray program is usually not warranted in the home garden; however, the following can be applied if desired:

Benomyl 50% WP at 1 mL/L of water;
or Captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations. The interval between last application and harvest is seven days.

Spray when first blossoms open, when plants are in full bloom and when wet weather occurs at harvest.

See Days to Harvest—Inside Back Cover.

DESCRIPTION	CONTROL
Raspberry Crown Borer	
New canes become spindly and develop swellings or galls at the base. Old canes have a pronounced swelling at the base or upper root. Canes break off when tied up in the spring. Plant damage is caused by a white worm with a brown head, up to 2.5 cm long. This insect spends 2 years in the larval stage.	Prune out canes with galls at the base, as close to the crown as possible. Watch for tunnels in the canes and kill any exposed larvae. For more stubborn cases, use: Diazinon 12.5% EC at 6 mL/L of water pouring about 500 ml of this solution on each crown when growth is 10 cm high in spring and repeat after October 15. Repeat again next year.



Raspberry crown borer larva in damaged cane

Root Rot	
Plants decline; leaves turn yellow, wither and become bronzed or scorched; berries often wither before ripening; roots become blackened and less fibrous.	Obtain plants only from plantings free of root rot, and place them in fertile, well-drained soil. Raspberries in particular do not like "wet feet". Do not replant in areas where raspberries have been killed out. The variety Newburgh can tolerate heavy soil.
Western Raspberry Fruitworm	
Adults are small (3 mm long) yellowish-brown beetles that feed on new leaves and flower buds. The yellowish worms are up to 5 mm long and feed inside berries.	If this pest was present the previous year, spray canes when blossom clusters separate with: Diazinon 12.5% at 6 mL/L of water.

Raspberry fruitworm

Yellow Rust	
Yellow spotting occurs on leaves in spring and summer. Cane cankers may occur under severe conditions. Varieties differ in susceptibility.	Remove old fruiting canes after harvest, remove refuse and cultivate in late fall or early spring to cover refuse. Spray lime sulphur at 40 mL/L of water at the green tip stage and two weeks later spray with lime sulphur 25 mL/L of water.

See Days to Harvest—Inside Back Cover.

DESCRIPTION CONTROL

STRAWBERRIES

Fruit Rot

Look for soft, rotted fruit which later becomes covered with a grey mould.

Grow varieties like Totem and Shuksan which are less susceptible to rot.

Avoid excessive leaf growth by limiting nitrogen fertilization. Avoid overhead sprinkling when berries are growing and ripening. Pick and remove rotten berries from berry patch.

If past experience indicates that a spray program can be justified, spray with:

Benomyl 50% WP at 1 mL/L of water;

or Captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations. The interval between last application and harvest is seven days.

Apply when first blossoms open, when plants are in full bloom and immediately after bloom.

Powdery Mildew

Infected leaves have an upward curling along the sides; undersurface has a greyish-white coating.

Control sprays are usually not warranted. Plant resistant varieties such as Totem and Shuksan. Remove severely infected leaves.

Red Stele Root Rot and Black Root Rot

Infected plants decline and produce little new growth. Inner core of roots shows a reddish tinge in spring, which later darkens to brown as the roots die and decay.

Black root rot may follow red stele, or may occur even when red stele has not been detected. Rots are spread by contaminated plants.

Plant resistant varieties such as Totem. Use only certified disease-free stock.

Establish new plantings in well-drained soil where disease has not been known to occur.

Root and Vine Weevils

See page 61.

Spittlebugs

A frothy spittle is found on deformed leaves and fruit, with a small, green insect underneath.

Spittle on undersides of leaves

Damage does not usually warrant use of insecticides. Control is almost impossible once spittle masses have been formed, but a high pressure water spray will dislodge many spittle bugs. If infestation was serious in previous years, spray when blossom buds appear:

Diazinon 12.5% EC at 6 mL/L of water;

or Malathion 50% EC at 2 mL/L of water.

Do not spray when plants are in bloom as these insecticides are toxic to pollinating insects. See page 16, Protecting Pollinators.

See Days to Harvest Table—Inside Back Cover.

DESCRIPTION	CONTROL
Strawberry Fruitworm (not common) New leaves are damaged and webbed together. Larvae enter ripening berries. Look for a whitish caterpillar with a tan head.	If this insect caused damage last year, spray plants with: Diazinon 12.5% EC at 6 mL/L of water; or Malathion 50% EC at 2 mL/L of water; or Thuricide at 1 mL/L prior to opening of first blossoms.

COMMON INSECTS AND DISEASES OF FLOWERS, SHRUBS, TREES AND LAWNS

DESCRIPTION

CONTROL

Algae, Lichens and Moss

Green and various coloured growths may be found on the twigs, limbs and trunks of many trees and shrubs. The growths may be leaf-like, hairy or scale-like.

Annual dormant sprays with lime sulphur and oil will prevent the establishment of these growths. Once established, however, they must be scraped off with a wire brush or stiff scrub brush before or in conjunction with spraying.

(a) Deciduous Trees and Shrubs: Spray lime sulphur at 120 mL/L of water during dormant period. (Do not use lime sulphur spray on apricots or filberts) or copper spray at 6 mL/L of water and use a spreader sticker.

(b) Evergreen Shrubs (e.g., rhododendron, juniper): Spray maneb 80% WP or mancozeb 80% WP at 4.5 mL/L of water.

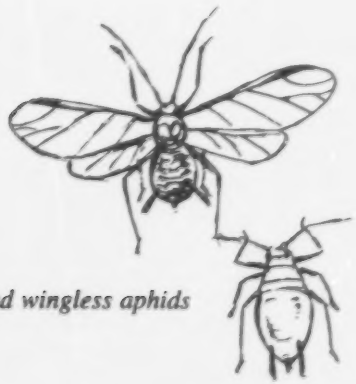
(c) Holly: Spray lime sulphur at 60 mL/L of water in early spring but not after April 1 or on a warm day. Apply mancozeb, maneb or zineb at 4.5 mL/L of water any time during growing season but not close to harvest as visible residues may be unsightly.

(d) A new product, Safer's DE-MOSS Cryptocidal Soap controls algae mosses, lichens and liverworts. Use as directed on the label.

Aphids

These insects attack a wide range of ornamental plants. Aphids cause leaves to curl and twist.

Look for small, soft-bodied, sap-sucking insects which vary in colour from pinkish-white to green and black. This pest will be found in clusters or colonies on stems and the undersides of leaves.



Winged and wingless aphids

These insects are best controlled when colonies are small, and before plant leaves start to curl.

In some instances, it may be possible to remove the insects by hosing down the plant with water.

Do not spray if predators such as ladybird beetles and lacewings have the situation under control. (See page 196).

Plants may be treated with:

Diazinon 12.5% EC at 6 mL/L of water;

or Safer's Insecticidal Soap at 20 mL/L of water;

or dimethoate 2E at 2 mL/L of water;

or dimethoate 2E as a paint-on treatment on stem as per label directions;

or dimethoate 4E at 1 mL/L of water;

or Malathion 50% EC at 2 mL/L of water;

or Pyrethrum 0.2% D according to label directions;

or Rotenone 1% D according to label directions;

DESCRIPTION	CONTROL
Caterpillars These pests attack a wide variety of plants. Some types feed within rolled leaves, others skeletonize leaf surfaces or form webs. Damage may occur throughout the growing season. Caterpillars come in a variety of sizes and colors. See: Bruce Spanworm and Winter Moth page 47.	Watch plants for signs of damage. If infestation is small, caterpillars may be removed by hand picking or by pruning and burning. If infestation is large, treat with: Diazinon 12.5% EC at 6 mL/L of water; or Methoxychlor 25% EC at 4 mL/L of water; or Sevin 5% D according to label directions; or Thuricide at 1 mL/L of water.
Elm Leaf Beetle and other Leaf Feeding Beetles Various species of beetles and their larvae feed on such trees and shrubs as elm, alder, willow and others.	When beetle or damage is first seen, spray with: Diazinon 12.5% EC at 6 mL/L of water; or Orthene at 4 mL/L of water; or Sevin 50 WP according to label direction. Repeat treatments later in the season if larvae or beetles re-occur.
Moles (Coastal area only) These animals feed mainly on soil insects and earthworms. They are small, dark-grey burrowing mammals up to 15 cm long.	Moles will *not* accept bait. Trapping is the best control method, and can be done throughout the year. Set traps only on currently used runways. These can be determined by stamping down the mounds and runways and checking which are re-established. Various traps are available; those most often used are the scissor or spear type. For complete instructions, obtain the Publication "Mole Control in British Columbia," available at BCMAF district offices.
Powdery Mildew This disease attacks a wide range of ornamental plants. Look for white, powdery growth on leaves and shoots.	Apply: Benomyl 50% WP at label rates. or Sulphur at label rates. Repeat every two weeks as necessary.
Root Weevil See page 61.	When fresh leaf-notching appears, spray with: Malathion 50% EC at 2 mL/L of water; or Orthene at 4 mL/L of water.
Scale Insects See page 49.	
Shothole Borer, Bark and Ambrosia Beetles See page 50.	

See Table of Pesticides Trade Names Page 107.

DESCRIPTION

CONTROL

Slugs

Slugs have soft, unsegmented bodies and exude a slimy mucus. They are active throughout the year if temperature and humidity are suitable. They shelter in moist, dark places during the day and feed at night. Surface tissues of the plants are rasped, and irregular holes are eaten in foliage leaving it slimy and tattered. Seedlings may be completely eaten and blooms on flowering plants may be severely damaged.

Slug

Bait protector

Slugs favour damp, shaded areas, so removing vegetative trash and other daytime hiding places will help to control them.

If slugs are an annual problem, apply control measures early when slugs are first noticed.

Place slug bait containing Mesurol or Metaldehyde in areas where the silvery, slime trails are evident. To protect pets, the bait should be placed under propped-up boards, rocks or in a bait protector made out of a coffee can (see below). Several holes are made along the bottom sides of the coffee can using a can opener. Bait is placed in the bottom of the coffee can and the lid is replaced.

or scatter 2% Mesurol bait at 500 g/100 m^2 around the area where slugs and slime trails are seen. MESUROL CANNOT BE USED ON FOOD CROPS;

or scatter slug bait containing Metaldehyde;

or spray metaldehyde 20% solution at 6 mL/L of water. DO NOT APPLY METALDEHYDE ON EDIBLE PARTS OF PLANTS.

Tent Caterpillars and Fall Webworm

Tent-forming caterpillars that occur in spring and early summer are forest and western tent caterpillars. Fall webworm occurs in late summer and early fall. They are variously coloured and hairy.

During the dormant season inspect branches of pencil thickness or thinner for "rings" of eggs. Prune them off and burn or destroy prunings;

or spray trees with dormant oil at 7 mL/L of water.

During the growing season, prune off small branches with tents on them, or spray with Diazinon at 6mL/L of water;

or Sevin 50 W according to label directions.

AZALEA

Azalea Leaf Gall

Leaves become thickened and develop into hard, brown, gall-like bodies.

Avoid overhead watering particularly in the evening. Spray with:

copper spray (49–53% active) just before buds break in the spring and again two to three weeks later.

If galls form, remove them by hand and dispose of them with the garbage or burn them.

Root Weevils

See page 61 and 69.

DESCRIPTION

CONTROL

BIRCH

Aphids

Treat as for birch leafminer. (*see* below)

Birch Leafminer

Grey, White and Paper birches are the most affected by birch leafminer. Young leaves have blotchy brown areas which contain a tiny worm.

Spray trees when damage first appears with:
dimethoate 2E at 2 mL/L of water;
or dimethoate 4E at 1 mL/L of water;
or Malathion 50% EC at 2 mL/L of water;
or use dimethoate 2E as a trunk paint treatment when first leaves are half grown.
These treatments will also control aphids.

CAMELLIA

Bud Drop

Flower bud drop may occur if plants are located in poor growing sites where they are exposed to cold, dry winds in winter or the hot summer sun. Low winter temperatures may also lead to bud drop.

Both overwatering and underwatering may result in bud drop.

Many older camellia varieties, especially those with white or pink flowers, are not reliably winter hardy in B.C. and regularly drop flower buds.

Bud drop may also occur if more flowers are set than the plant can support, in this case, there is no cause for alarm.

Plant camellias in sheltered sites in well-drained soils that have good organic matter content. To avoid spring frost damage to flower buds resulting in brown petals, choose sites that do *not* receive early morning sun.

Water plants thoroughly during hot dry summer weather.

Select varieties recommended as hardy by your local nurseryman.

Scale Insect

See Page 49.

Sooty Mold

See Page 24.

See Table of Pesticides Trade Names Page 107.

DESCRIPTION CONTROL

CEDAR

Cedar Flagging

Isolated branchlets of western red cedar bear distinctive yellow or red, dying or dead foliage. This is not a disease and is usually caused by hot dry weather either in summer or towards the end of the growing season.

Provide trees with adequate watering during hot, dry weather.

Cedar flagging

CONIFERS

Needle Drop

Conifer needles live three or more years before they die and drop off. During the autumn, needle drop is a normal condition and is no cause for concern. The trees may look sparse but will fill out again with new growth next spring.

A heavy loss of needles during the growing season indicates pest problems or cultural problems such as poor drainage or soil fertility.

Maintain the tree's vigour by using a balanced fertilizer in the spring and provide adequate water during the summer.

COTONEASTER

Cotoneaster Webworm

In the spring, new leaves are skeletonized and webbing is present on leaves and twigs.

Damage is caused by worms which feed from silken tubes.

If damage or webbing is present when leaves start to form, spray with:

Diazinon 12.5% EC at 6 mL/L of water;
or Malathion 50% EC at 2 mL/L of water;
or Methoxychlor 25% EC at 4 mL/L of water.

CRAB APPLES (Flowering)

See under "APPLES AND PEARS" page 51 for description and control of pests.
Use small-fruited varieties to prevent codling moth population increases.

DESCRIPTION CONTROL

CYPRESS (Chamaecyparis)

Cypress Root Rot

This disease affects all varieties of Lawson's cypress, heathers and yews. Trees turn brown and die. Root tissues become reddish brown instead of white.

Plant in well-drained soil.

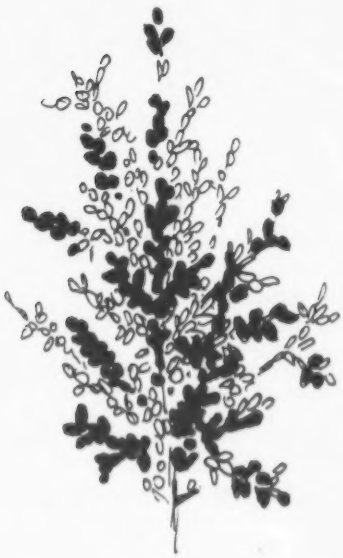
Choose resistant varieties such as Thujas and Junipers. Avoid Lawson's cypress unless it is grown on a resistant rootstock.

Cypress Tip Moth

This insect also attacks arborvitae and junipers. Tips of branches become brown and drop off. Tiny (4 mm long) white cocoons appear on affected twigs in April to May. Small (5 mm long) grey moths are present in June and July.

Spray damaged trees with:

Diazinon 12.5% EC at 6 mL/L of water in late April, mid-June and again in early July.



Cypress tip moth damage

DOGWOOD

Crown Canker

Cankers appear on branches and on trunk near soil surface. These become sunken, and bark peels away.

Plant only where there is good soil drainage.

When transplanting, avoid wounding or injuring the bark with machinery or lawn tools.

If the affected area is small, gouge out the discoloured cambium and sapwood and treat with tree paint.

DESCRIPTION

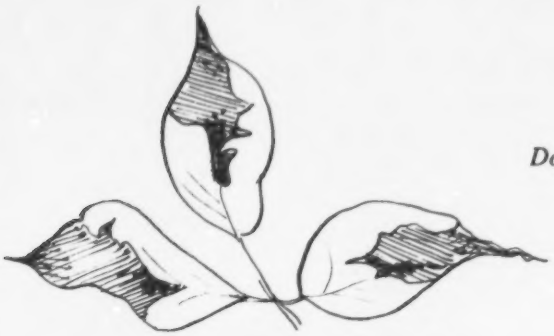
CONTROL

Dogwood Leaf Blotch

A new disease of dogwood in south coastal B.C. appears as brown spots, blotches and wedge-shaped areas at the leaf tips. This disease is favored by periods of wet weather. Premature defoliation occurs and twigs and branches may develop cankers and dieback.

Rake up and burn or dispose of any fallen dogwood leaves during the growing season and autumn. Remove dead or diseased twigs and branches.

Fungicidal sprays have not yet been evaluated. However, Benomyl 50% WP at 1 mL/L of water could be used on a trial basis. Thoroughly spray the tree at bud break and 10–14 days later. If rainy periods occur later in the season additional sprays may be required.



Dogwood leaf blotch

DOUGLAS FIR

Cooley Spruce Gall Aphid

These aphids appear as white fluffs on fir needles in the spring. Unless the infestation is very severe, trees will not be damaged. Some needles may drop.

On spruce trees they cause brown galls on tips of branches (See illustration page 88).

If severe infestation existed in the spring, spray in mid-August with:

dimethoate 2E at 2 mL/L of water;

or dimethoate 4E at 1 mL/L of water.

Add soap to the spray solution at 2 mL/L of water and spray trees to the point of run-off;

or Safer's Insecticidal Soap at 20 mL/L of water.

FIR OR BALSAM

Balsam Woolly Aphid

Attacks native or ornamental true fir trees such as Grand, Amabillis, Mountain, Balsam and White fir, but not Douglas fir.

These small insects cause infested twigs to develop a knobby or "gouty" appearance. Infested trunks and branches show white tufts of cottony substance produced by adult aphids.

To prevent the spread of this insect, provincial regulations prohibit the sale or shipment of all species of balsam or true fir out of the infested zone which includes southern Vancouver Island and the Lower Mainland (Vancouver Forest District).

Spray affected trees between February and March with:

Diazinon 12.5% EC at 6 mL/L of water;

or Safer's Insecticidal Soap at 40 mL/L of water thoroughly wetting the entire tree. Repeat this treatment in mid-summer and early fall.

See Table of Pesticides Trade Names Page 107.

DESCRIPTION CONTROL

GLADIOLUS

Mites

See page 62.

Thrips

See page 25.

HAWTHORN

Aphids

See page 68.

Leaf Blight

Small spots appear on leaves in mid-summer eventually causing premature defoliation.

Spray opening leaves every 10 to 14 days with any convenient fungicide such as:

Captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations.

or Benomyl 50% WP at 1 ml/L of water;

or copper spray (49–53%) at 4 ml/L of water;

Rake up and burn fallen leaves.

HOLLY

Holly Bud Moth

Tips of buds are destroyed or disfigured. Terminal shoots are tied together with silk.

Look for worms inside silk or terminal shoots, and greenish-grey caterpillars on developing buds.

If present the previous year, spray holly when new leaf growth starts between April 1 and early May. Use:

Diazinon 12.5% EC at 6 mL/L of water;

or Malathion 50% EC at 2 mL/L of water.

Holly Leafminer

Blotches appear on leaves, making holly unsightly. This discolouration is caused by mines formed by small maggots which feed in the tunnelled leaves. Adult flies, half as large as house flies, lay eggs during blossom time.

If present in the previous year, spray branches after blossoming is finished with:

Diazinon 12.5% EC at 6 mL/L of water;

or dimethoate 2E at 2 mL/L of water;

or dimethoate 4E at 1 mL/L of water.

Holly leafminer

See Table of Pesticide Trade Names Page 107.

DESCRIPTION

CONTROL

Holly Scale

This pest also attacks boxwood, laurel and privet. Plant vigour is reduced, and yellow spots appear on leaves. A black, sooty material grows on the secretion of this small, flattened, tan-coloured scale insect.

Spray holly in late June with:
dimethoate 2E at 2 mL/L of water;
or dimethoate 4E at 1 mL/L of water;
or Malathion 50% EC at 2 mL/L of water.
Repeat this treatment in 10 days.

Mature scales

Scales

Immature over-wintering scales

Root Weevils

(See page 61 and 69.)

HOLLYHOCK

Rust

Look for orange to red, raised pustules or raised spots on the undersides of leaves. The pustules contain rusty, powder-like material.

Remove and destroy the first leaves that show signs of rust. Spray with:
Zineb 75–80% WP at 3 mL/L of water;
or use sulphur dust or spray once or twice a week.
In the fall, plants should be cut back to the base and all old parts burned.

JAPANESE FLOWERING CHERRIES

This ornamental is prohibited in the Okanagan Valley by the British Columbia *Plant Protection Act* because it is a possible source of little cherry disease for commercial sweet and sour cherry orchards.

See under "PEACHES, APRICOTS, PRUNES, PLUMS AND CHERRIES", page 55 for description and control of pests.

JUNIPER

Juniper Die-Back

Individual branches or whole shrubs turn yellow to brown and die.

Die-back is a complex disease which may be caused by fungi attacking the branches or roots, magnesium deficiency or unsuitable soil conditions.
In order to arrive at suitable control measures, an evaluation of the cause must be made.

See Table of Pesticides Trade Names Page 107.

DESCRIPTIONS	CONTROL
Juniper Scale	
This insect also attacks arborvitae, cedar and cypress. Infested plants turn grey or yellow and produce little new growth. Look for 3 mm long greyish-white scales on needles, cones and twigs.	Prune out and burn all dead or dying branches. In the Okanagan Valley, dormant oil applied in March provides effective control. In other areas, control can be obtained by spraying trees in the last week of May with: Diazinon 12.5% EC at 6 mL/L of water. Repeat this treatment in two weeks. Spray trees with enough pressure to penetrate all foliage.
Juniper Webworm	
This pest webs needles and the tips of twigs, as it feeds on needles, turning them brown. Damage is caused by reddish-brown caterpillars with a light stripe along each side. They measure up to 12 mm long.	Spray trees when caterpillars become active in the spring. Apply: Diazinon 12.5% EC at 6 mL/L of water with enough pressure to penetrate webbed foliage. Check trees in July for new infestations and, if present, repeat treatment.
Pear Trellis Rust	
A disease which alternates between junipers and pear trees. The infections on junipers cause branch swellings which produce conspicuous orange spore masses in the spring. In mid-summer bright orange spots appear on the leaves of pear trees adjacent to infected junipers. The shrubs are not seriously damaged by the disease.	In order to safeguard the nursery and pear industries of British Columbia, all infected junipers in the Fraser Valley must be destroyed. No junipers may be taken from the Fraser Valley to the Okanagan unless they are certified to be free of the disease. No junipers grown on Southern Vancouver Island should be moved outside of that area.
Tip Moth	
See page 73.	

LAWNS

Diseases	
Most diseases cause patches of discoloured grass, but discoloured grass is not necessarily a symptom of a disease.	See B.C.M.A.F. publication "Diseases of Lawns" (available from B.C. Ministry of Agriculture and Food district offices)
Earthworms, Dewworms, Nightcrawlers	
Earthworms in moderate numbers are of benefit as their tunnels provide for aeration of the soil. However, large numbers of earthworms may cause an excessive number of mound-shaped castings on the lawn surface, while at the same time depleting the soil of its humus content.	If control is needed, use: Sevin 50WP at 250 g/100 m^2. This treatment will also control lawn moth larvae if present.

See Table of Pesticides Trade Names Page 107.

DESCRIPTION	CONTROL
Fairy Rings and Mushrooms	
Semi-circles or rings of dark green grass appear in the lawn. Turf within this ring is yellowish or dead. Mushrooms, toadstools and puffballs may grow within the ring.	Application of nitrogen and ample irrigation during the growing season may mask the symptoms, but will not eliminate the problem. Excessive organic fertilizer may aggravate the problem. Eradication requires a great deal of work. For instructions, obtain the Agriculture Canada publication number 273.630 "Fairy Ring Biology and Control". These pamphlets are available from the B.C. Ministry of Agriculture and Food, 17720—57th Avenue SURREY, B.C. V3S 4P9 or Box 198 SUMMERLAND, B.C. V0H 1Z0 or Parliament Buildings VICTORIA, B.C. V8W 2Z7
Lawn Moths	
Irregular brown patches appear in lawn where grass blades have been chewed off at ground level. This damage is caused by small white worms 1.4 to 1.9 cm long. The worms live in the turf, but are hard to find there. They develop into pale moths which are active at dusk. The moths are attracted to light. These pests will move in from other infested lawns that are nearby.	These insects can be detected by examining the lawn from March to April, and again from late August to early September. Do not treat unless larvae are present and are causing severe damage. Treat with Diazinon 12.5% EC using 350 mL in enough water to cover 100 m^2 of lawn; or with Sevin 50% WP using 110 mL in enough water to cover 100 m^2 of lawn. Water thoroughly after treatment, and keep children and pets off grass until it is dry.
Leatherjackets (Marsh Crane Fly)	
This insect may also damage young flower or vegetable seedlings and transplants. It feeds on roots, causing irregular brown patches to appear in the lawn. Look for brown-grey, worm-like maggots up to 3.8 cm long, at or just below the soil surface. These insects are only a problem in coastal areas. See illustrations page 29.	If present the previous year, or if more than 19 maggots are found per 900 cm^2 of turf, spray lawn once between the first of October and the end of May, when the ground is not frozen. Apply: Diazinon 12.5% EC using 300 mL in enough water to cover 100 m^2 of lawn.
Moles	
See page 69.	

See Table of Pesticides Trade Names Page 107.

DESCRIPTION	CONTROL
Moss	
Moss is a common weed of neglected turf in high rainfall areas, but it cannot compete with a vigorous, healthy lawn. Chemical treatment using moss killers provides only temporary control. Growing conditions must be improved to prevent the re-establishment of moss.	Conditions that favour the growth of moss include poor soil aeration, poor drainage, low fertility, high acidity and heavy shade. Alter these conditions to help prevent the re-establishment of moss and encourage grass vigour. Apply to mossy areas: Commercial moss killers following label rates and directions. or Ammonium sulphate at 5 kg/100 m^2. Do not water but allow the fertilizer to burn out the moss. or Copper sulphate applied in solution at 150 g/20 L of water to cover 100 m^2. About 2 weeks after treatment remove dead moss by raking. Apply lime if the soil is acid (less than pH 6). If grass is thin or bare patches are present overseed with an appropriate grass mixture, one with shade tolerant grass (fescue) if shade is a problem.
Mushrooms	
Mushrooms often appear in lawns without being associated with fairy rings. They generally appear during warm, wet weather in spring and fall.	There is no simple control short of renovating the lawn and removing the organic matter which is acting as the food source for the mushrooms. However, the lawn surface may be frequently raked to break up the mushrooms.
Weed Control	
See page 91.	

LILAC

Bacterial Blight	
Flowers become limp and dark brown. Young shoots and immature leaves darken and die quickly.	Cut out and burn all infected parts immediately. Spray with copper spray (49-53% active) 3 mL/L of water. Apply this treatment before the fall rains start, and again in the spring if new infections are detected.

See Table of Pesticides Trade Names Page 107.

DESCRIPTION

CONTROL

Lilac Leafminer

Colorless blotches appear on leaves and later turn brown. The tree looks scorched.

Discolouration of leaves is caused by tunnels formed by tiny caterpillars which feed inside leaf tissue.

If present the previous year, paint dimethoate 2E directly on to limbs 30 cm from the ground. Treatment should be applied in late April and repeated in early July.

Leafminer can also be controlled by spraying lilac bushes just prior to bloom, and again 7-8 weeks later with:

Dimethoate 2E at 2 mL/L of water;
or Malathion 50% EC at 2 mL/L of water.

Leaves damaged by lilac leafminer

Oystershell Scale

See page 49.

MAPLE

Boxelder Bug

See page 100.

Scale Insect

See page 49.

Leaf Scorch

Leaves of ash, maple, oak, elm and horse chestnut can turn yellow or reddish-brown around the edges and between the veins. Entire leaves may wither and drop off. Drought during hot, dry, windy weather in the summer is often the cause of leaf scorch. Other possible causes of leaf scorch are low temperatures, excessive water, girdled roots or confined root growth.

Provide adequate fertilizer and water to maintain the tree's vigour.

MOUNTAIN ASH

Blister Mites

Reddish-brown spots appear on leaves. These cause leaves to curl, twist or develop dead burned areas. Affected leaves may drop off.

If blister mites were present in the previous growing season, treat trees in the dormant stage with:
lime sulphur at 100 mL/L of water.

DESCRIPTION CONTROL

NARCISSI (Daffodils)

Basal Rot

Foliage turns yellow and dies back early. Plants produce small flowers. Bulbs are infected with a chocolate-brown rot.

Before planting, examine bulbs carefully for infected tissue.

After digging bulbs out in the fall, dust them with:

Benomyl 50% WP;

or dip them in a solution of Benomyl 50% WP at 2 mL/L of water.

Narcissus Bulb Fly

This insect also attacks snowdrops, hyacinths, tulips and other bulbous plants.

Plants stop flowering and either degenerate into masses of small, grass-like leaves, or die. Bulbs are tunnelled and usually rotted.

Damage is caused by a large maggot, measuring up to 2 cm. The adult flies resemble bumble bees.

If present the previous year, mix Diazinon 5% G into the soil used to cover the bulbs at planting.

Protect growing bulbs by applying Diazinon 5% G into foliage and onto soil around plants. Start in May and repeat every 10 days until July. Digging up the bulbs after foliage has died down and destroying the wormy ones will help to control bulb fly increases.

OAK

Anthracnose

Garry and other white oaks are attacked most seriously. Black, red and scarlet oaks are rarely damaged. Brown leaf blotches develop, eventually covering most of the leaf area.

Rake up and burn, or compost fallen leaves.

Spray small trees in the dormant stage with lime sulphur. When buds burst, spray with:

Captan according to label directions, and repeat in two weeks. The use of captan has been reviewed. Check new label for current recommendations.

Bruce Spanworm and Winter Moth

See page 47.

Winter Moth is a problem on Southern Vancouver Island only.

Caterpillars

See page 47.

Leaf Scorch

See page 80.

See Table of Pesticides Trade Names Page 107.

DESCRIPTION CONTROL

PEONIES

Botrytis Blight

Plants fail to flower. Young stalks wilt and blacken, and later develop a covering of grey mould.

Remove and burn diseased parts immediately. Avoid overhead watering during the evening.

Spray with:

Captan according to label directions, when leaves are about 30 cm high, and again two weeks later. The use of captan has been reviewed. Check new labels for current recommendations.

A third application may be necessary if bud blast develops.

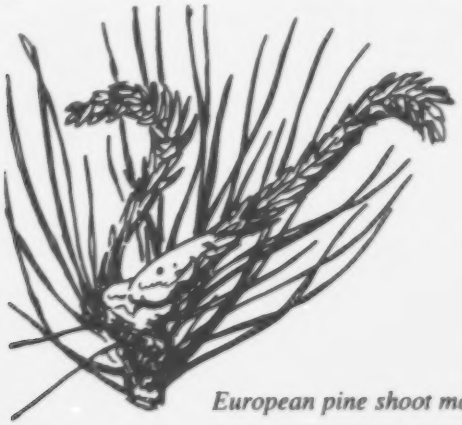
PINE

European Pine Shoot Moth

This pest attacks most species of pines. Infested buds exude pitch. The following spring, new growth may be distorted, or fail to develop.

Look for brown caterpillars with black heads, about 6 mm long.

The caterpillars bore into terminal buds during mid-summer



European pine shoot moth damage

To control this insect, prune and burn damaged shoots.

If this measure does not give control, apply three sprays of:

Diazinon 12.5% EC at 6 mL/L of water;

or dimethoate 2E at 2 mL/L of water;

or Sevin 50% WP according to label direction.

Apply at 10-day intervals, beginning in the last week of June.

The addition of Safer's Insecticidal Soap at 10 mL/L of water will aid in control.

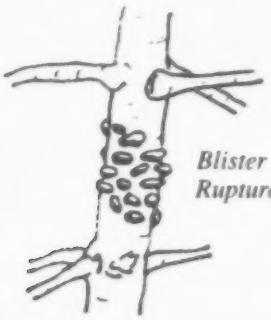
See Table of Pesticides Trade Names Page 107.

DESCRIPTION	CONTROL
Lophodermium Needle Cast Scots pine is commonly affected. One to two year old needles develop yellow to brown bands about 3 mm wide. Infected needles turn brown and fall, so that trees may be left with only one year's needles.	Rake up and destroy fallen needles. Where Scots pine is located in dense plantings, and the disease has become a problem, apply: Benomyl 50% WP at 2 mL/L of water: or Daconil 2787 500F (chlorothalonil) at 3.5 mL/L of water; or Mancozeb 80W at 6 mL/L of water. or Zineb 75–80% WP at 6 mL/L of water. Treat trees in late July, late August and Late September.
Pine Needle Scale This insect also attacks fir and spruce trees. Needles drop and tree vigor is reduced. Look for small, white, club-shaped scales on needles.	Spray during the last week of June with: Diazinon 12.5% EC at 6 mL/L of water; or Malathion 50% EC at 2 mL/L of water. Repeat this treatment in three to four weeks.
Western Gall Rust Rough, globular galls on branches or trunk. Release orange spores in spring. Commonly seen on native lodgepole or shore pine. No alternate host involved.	If practical, remove infected branches and/or trees within 300 m. Spray valuable trees as for Lophodermium Needle Cast except that the applications should be made earlier. Observe galls and spray when spores are being released.

Gall

See Table of Pesticides Trade Names Page 107.

DESCRIPTION	CONTROL
White Pine Blister Rust	
In late April or early May, swellings on the branches and trunk rupture, releasing orange spores. The branch may die beyond the swollen area. New infections occur as a result of spores being blown from currants and gooseberries during spring and fall.	In coastal areas where currants and gooseberries are abundant, do not plant five-needle pines for ornamental purposes. If established white pines are to be saved, prune out galls if they are more than 10 cm from the trunk and eliminate currants and gooseberries from the vicinity on your property. Trees will eventually die of this disease if the main trunk is infected.



Blister rust
Ruptures with orange spores

POPLAR

Aphids	
See illustration page 68.	Gall and blister forming species cannot be controlled.
Poplar and Willow Borer	
Look for sawdust being cast out of holes in trunk or limbs. Cream colored larvae with brown heads, up to 12 mm long can be found in those holes.	Control is usually not possible because, by the time sawdust is observed, the damage has occurred, and the tree cannot be saved. Prevention is not practical. Plant trees other than poplar and willow.
Poplar Leaf Blisters	
Distinct yellow blisters develop on the underside of the leaves in late spring to early summer. These blisters caused by a fungus, eventually turn brown and premature defoliation occurs.	Rake up and dispose or burn any fallen leaves.

PYRACANTHA

Scab	
Look for dark, sooty areas on the leaves and berries.	Not a serious problem when sheltered from rain, planted against a wall under eaves. If present the previous year, spray bushes in the spring, just as the buds begin to swell. Use: Captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations. Repeat this treatment twice, at two-week intervals.

DESCRIPTION CONTROL

RHODODENDRON

Bud Drop or Failure to Flower

Bud drop, or failure of flower buds to form may be due to the young age of plants. Some rhododendrons only bloom sporadically during the first few years of growth.

Little fertilizer, or use of high nitrogen fertilizers, may limit flower production.

Poor planting sites, with too much shade, may result in good vegetative growth but few flowers.

Poor weather during the previous summer when flower buds are forming may result in poor flower displays.

To promote flowering:

Plant rhododendrons in well-drained soils in sites where there is protection from cold, dry winter winds. Rhododendrons also need protection from the hot summer sun, but avoid planting in dense shade; high, light shade is preferred.

Water deeply and thoroughly during dry weather. Fertilize when new growth is elongating during the spring with a fertilizer specifically recommended for rhododendrons. Remove spent flowers to prevent seed formation.

Leaf Scorch

During the winter when it is cold, dry and windy and the ground is frozen broadleaved evergreens such as rhododendrons and azaleas cannot take up sufficient water. This can also occur during hot, dry weather in summer. The leaf margins begin to dry out and turn a reddish to dark brown.

Plant rhododendrons and azaleas in sites that are protected from prevailing winds and sun scorch. Choose varieties that are winter hardy. Bark mulch is also beneficial.

Supply adequate water in the summer during hot, dry periods.

Leaf Spot and Blight

Year-old leaves turn brown at the margins or develop spots or blotches. Various moulds may appear on the dead tissue during wet weather.

Most rhododendron leaf and bud problems are caused by lack of moisture. Plants can dry up in hot summers and in cold, dry winters.

To allow for this, always plant rhododendrons in partially sheltered and shaded locations. Never allow them to dry out in summer.

Root and Vine Weevils

See page 61 and 69.

See Table of Pesticides Trade Names Page 107.

ROSES

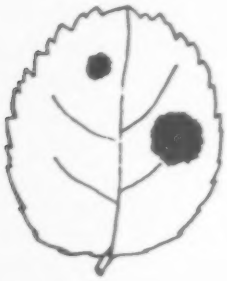
Aphids

See page 68.

Black Spot

Look for circular, black spots on leaves.

Varietal susceptibility lists are available from the local Ministry of Agriculture and Food office.



Black spot

Infected rose leaf

Rake up and burn all leaves at the end of the summer. In the dormant season, apply lime sulphur using one part lime sulphur to nine parts water. This treatment must be applied before buds start to grow.

During the growing season in spring and early summer, apply:

Benomyl 50% WP at 1 mL/L of water;

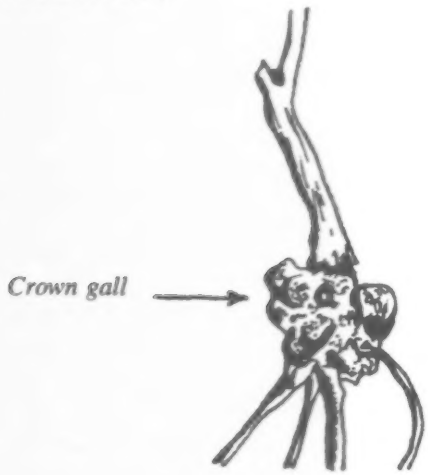
or Captan according to label directions. The use of captan has been reviewed. Check new labels for current recommendations.

or Phaltan at label rates;

or Sulphur 65% WP at 12 mL/L of water. Apply this treatment at one to two-week intervals.

Crown Gall

Rough, warty galls up to 5 cm or more in diameter on lower stem or roots.



Avoid planting in beds known to be infested; prune out and destroy galls when they are seen. Disinfect pruners regularly when working with infected stock by using a 1:10 solution of phenol based Lysol in water.

Powdery Mildew

Some older, climbing varieties are particularly susceptible to this disease, especially when they are planted in damp or shady locations.

Look for white, powdery growth on leaves and shoots.

Varietal susceptibility lists are available from the local Ministry of Agriculture and Food office.

Rake up and burn all leaves at the end of summer. In the dormant season, apply lime sulphur using one part lime sulphur to nine parts of water. This treatment must be applied before buds start to grow.

If required in spring and early summer, apply:

Benlate 50% WP at 1 mL/L of water;

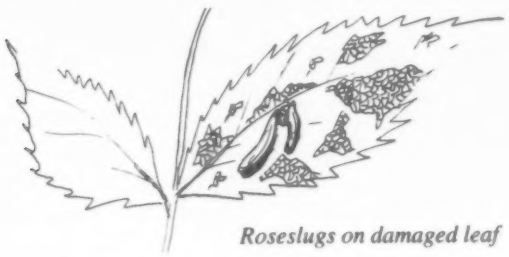
or Karathane at label rates;

or Phaltan at label rates;

or Sulphur 65% WP at 12 mL/L of water.

Apply this treatment at one to two-week intervals.

DESCRIPTION	CONTROL
Roseslug	
Leaves are skeletonized, and later turn brown. Damage caused by small, yellowish-green, slug-like caterpillars.	When damage first appears or insects are seen, spray bushes with: Diazinon 12.5% EC at 6 mL/L of water; or Malathion 50% EC at 2 mL/L of water; or Safer's Insecticidal Soap according to label directions.



Roseslugs on damaged leaf

Rust	
Look for small, orange spots. Varietal susceptibility lists are available from the local Ministry of Agriculture and Food office.	Rake up and burn all leaves at the end of summer. In the dormant season, apply lime sulphur using one part lime sulphur to nine parts water. This treatment must be applied before buds start to grow. If required in spring and early summer apply: Sulphur 65% WP at 12 mL/L of water. Apply this treatment at one to two-week intervals.
Thrips	
See page 25.	

SNAPDRAGONS

Rust	
Brownish spots form on the underside of leaves.	Most giant varieties are resistant. Avoid overhead watering during the evening. Do not overwinter plants as they are a rust infection source for new plants. For severe infections, apply: Sulphur 65% WP at 12 mL/L of water. or Zineb 75–80% WP at 4 mL/L of water;

See Table of Pesticides Trade Names Page 107.

DESCRIPTION

CONTROL

SPRUCE

Cooley Spruce Gall Aphid

This aphid also attacks Douglas fir, where it appears as tiny white tufts on the needles; see page 74.

Terminal growth on spruce trees develops galls 2.5 to 5 cm long, green to purple in colour, which later become dry, hard and brown.

Colonies of aphids live inside the galls at the base of each needle.

For control on Douglas fir see page 74.

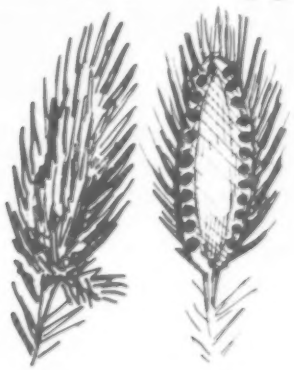
Remove galls from trees as they form, and burn them.

If they are too numerous for this treatment, spray at bud-burst with:

Diazinon 12.5% EC at 6 mL/L of water;
or Safer's Insecticidal Soap at 20 mL/L of water.

Thorough spraying is required for good control.

Control is usually not necessary on Douglas fir, except on seedling trees.



Spruce gall cut open to show aphid chambers

Spruce Aphid (Coastal British Columbia)

Trees lose the needles on twigs, except for current growth. The inside of tree becomes bare.

Damage is caused by a small, dull-green aphid, which may be present on needles from February to mid-summer. This insect can kill trees that are attacked 2–3 years in succession and not treated.

When early damage appears or insects are noticed, spray trees with:

Diazinon 12.5% EC at 6 mL/L of water
or Safer's Insecticidal Soap at 20 mL/L of water

Repeat treatment every two weeks until mid-June or until aphids are controlled.

Spruce Mites

See page 62. Two-spotted mite.

Damage occurs during the hottest part of the growing season.

Treat in early May when mite eggs hatch.

Spruce Needle Miner

Light green caterpillars, 6 mm long are fully grown in April. They web needles and frass together. Moths are present in May.

Spray applied during early April will kill mature larvae.

Spray applied during May will kill moths.

Spray applied during June will kill newly hatched larvae.

Use: dimethoate 2E at 2 mL/L of water;
or Diazinon 12.5% EC at 6 mL/L of water.

Addition of Safer's Insecticidal Soap at 10 mL/L of water will aid control.

DESCRIPTION

CONTROL

Spruce Weevil

Leaders are killed by cream-coloured weevil larvae 7 mm long, which bore into leaders. Weevils are reddish brown with patches of brown or grey scales, and are 5 to 7 mm long. They are present in April and May when they lay their eggs.

Prune off and burn wilting, dying or dead leaders. Tie a side branch into an upright position. This will form a new leader.

Use sprays to kill weevils in April and May, August and September.

Apply:

Diazinon 12.5% EC at 6 mL/L of water;

or Methoxychlor 25% EC at 3 mL/L of water.

THUJA

Keithia Blight

Irregular to circular brown to black cushions appear on scale leaves in late spring. The leaves then turn brown and affected areas fall out. Later leaves drop, leaving branches bare.

Blighted Thuja leaves

The first spring after planting out in a home or landscape situation, apply:

Fixed copper at 4 mL/L.

or maneb or zineb at 3 mL/L during infection period, late March to mid-June.

Tip Moth

See page 73.

WALNUT

Birds

Crows and some jays feed on walnuts when they ripen.

Animated scare crows repel birds. Netting nut trees may be the only practical solution.

Blight (Coast only)

Brownish spots develop on new spring leaves, causing them to scorch, wither and drop. Black slimy spots appear on nuts, penetrating both the husk and shell.

Blighted walnut

Spray with a copper spray (49–53% active) at 6 mL/L of water;

Apply in the fall after leaves have dropped, and twice in the spring: When new leaves are first visible, and two weeks later.

DESCRIPTION CONTROL

Caterpillars

See page 69.

Fall Webworm

See page 70.

WILLOW

Giant Bark Aphid

Black aphids, 2–4 mm long, suck sap from branches and cause sooty mold. Secretions may also attract many wasps.

See Page 68.

Blight

Swollen, spindle-shaped cankers encircle small branches, causing branch tips to die. Black spots appear on leaves. Defoliation may occur.

Spray with benomyl 50% WP 2 mL/L of water. Apply at least twice in the spring: When leaves are first visible, and two weeks later. Under wet conditions continue spraying until mid-June.

Blighted willow twig

Caterpillars

See page 69.

Fall Webworm

See page 70.

Poplar and Willow Borer

See page 84.

Willow Leaf Beetle

See page 69, Elm Leaf Beetle.

Willow Leaf Galls

Plant-parasitic wasps deposit eggs into willow leaves. The larva feeds within the leaf, causing a swelling or bump to develop at that site.

Control is not necessary as this insect does not seriously affect the vigour of the tree.

See Table of Pesticides Trade Names Page 107.

WEED CONTROL

See Weed Illustrations—Page 96.

Weeds are undesirable in lawns, flower beds and in areas where fruits and vegetables are grown. They compete with garden plants for water, nutrients, light and space, and reduce yield and quality.

Established weeds should be controlled before their seeds mature. Many weeds are capable of producing twenty thousand seeds per plant or more.

Hand weeding is still the most effective control for weeds in the home garden because it is selective and safe. The gardener can remove the problem weeds without risking possible injury to desirable garden plants. It is important to realize that herbicides have the potential to kill desirable plants along with weeds, if they are used improperly.

There are several other good methods of controlling weeds without chemicals. Mulches of grass clippings, sawdust, plastic and newspaper are often an effective means to reduce weeds. These measures should be used in areas where fruit and vegetables are grown, and where herbicides are not recommended.

Mulches should be 5 to 7 cm thick to prevent germination of weed seeds. Established perennial weeds such as curled dock, Canada thistle and dandelion will require cutting at the ground line. Quack grass roots usually rise into the mulch and can then be pulled out. Around ornamental shrubs such as junipers and rhododendrons, black plastic placed below the mulch before it is put down will suppress many perennial weeds and prevent establishment of seedling weeds. In the late fall in small garden areas, weeds should be worked in by rotovator or digging, then covered with black plastic which can be held in place by planks. This prevents establishment of winter annual weeds. Large gardens can be sown to fall rye to suppress weeds but dig the rye under early in the spring. It is difficult to kill and becomes weedy itself if it is allowed to grow too large.

Herbicides are sometimes useful for the control of weeds in lawns, on driveways, around ornamental plantings or along fence-lines. Used properly, along with good garden management practices, herbicides can be very effective; used improperly, they can injure desirable plants in the area.

WEED CONTROL IN LAWNS

Maintain a strong vigorous lawn to help prevent invasion by weeds. Weeds are most serious in newly established lawns. DO NOT APPLY HERBICIDES until newly seeded grass has been cut once or twice. Mowing will control seedling weed growth. Most broadleaved weeds in established lawns can be controlled with chemicals that will not harm the lawn. Grassy weeds will not be controlled by these selective weed-killers.

Keep lawn herbicide mixtures containing dicamba well away from the root area of trees and shrubs. At the higher rates it may leach into the soil and injure or kill trees and shrubs. Near flower or shrub borders put up a plastic, cardboard or plywood sheet when spraying near the border. Apply in warm weather. **Do not spray in hot weather.** Use low pressure and high water volume to prevent fine droplets or mist which may travel in the air to areas where sensitive plants are growing. Treat weeds when they are actively growing. Lawns under stress because of insufficient moisture may be injured by herbicides.

WEED	PAGE	HERBICIDE TO USE ON LAWNS	REMARKS AND APPLICATION SUGGESTIONS
Fall dandelion dandelion, plantain, catsear, heal-all	97 96 98 97	2,4-D or MCPA	Use amine or low-volatile ester formulations of chemicals. Use according to label directions. 2,4-D will control heal-all only if applied to actively growing stages.
Chickweed, clovers, black medick, pearlwort	96, 97 98	Mecoprop (MCPP)	Domestic mixtures will vary in their active ingredients of herbicide.
Creeping buttercup	96	MCPA or Mecoprop	Apply at label rates. Spray on warm, calm days at low pressure to avoid drift. Spray when weeds are actively growing before flowering. Repeat applications as required.
Veronica (speedwell)	96	Mecoprop (MCPP) or ioxynil	Apply in spring as label directs and repeat in two weeks. Apply in fall as label directs and repeat in two weeks. Burning effect on grass plants is temporary. Mecoprop must be applied as repeat treatments and provides suppression only. Mecoprop and ioxynil sprays give good control of chickweed and clovers as well as speedwell.
English daisy, knotweed, clovers, chickweeds, pearlwort	97 98 96, 97	dicamba, 2,4-D mecoprop mixtures	Apply at label rates in early spring not later than early bloom. Dicamba is effective on clovers and other weed species, but does not control plantain. Do not use more than the recommended rate. Extremely dangerous around shrubs and trees.
Mosses and pearlwort		Ferrous ammonium compounds (commercial mixtures)	Apply evenly according to manufacturer's directions. The use of ferrous ammonium compounds gives only temporary control. Improve soil fertility, drainage and aeration for permanent control.
Knapweeds, diffuse & spotted	99	2,4-D	Cut grass regularly to keep weeds from going to seed.
Couchgrass (quackgrass)	99		Once in the lawn, couchgrass cannot be selectively controlled without damaging lawn grasses. Hand weeding, digging out and renovating the lawn are useful cultural control methods. Maintain a healthy, vigorous lawn to lessen the chance of couchgrass establishment.
Smooth Crabgrass	99		Crabgrass is an annual weed and positive identification should be made before applying control measures. Maintain a healthy and vigorous lawn to lessen the chance of crabgrass establishment. There are several crabgrass killers available for use on established lawns only. Follow the label directions for the correct rates and timing of application in the spring, either before the crabgrass seeds germinate or just after they emerged.

Bamboos

While bamboos are planted for their ornamental value in the coastal area, they can spread quickly and become aggressive weeds. Bamboo should only be planted in areas where their root systems can be confined, for example in concrete or metal containers. Control measures will need to be repeated to eradicate bamboo once it becomes a problem.

Control

Mechanical Control:

Dig and remove all underground parts. If new growth occurs, dig it up and remove it *immediately*. This method works only if prompt and complete removal of all plant parts continues.

Chemical Control:

Bamboo is a member of the grass family, therefore it can be controlled by the same herbicides that are registered for use on other problem grasses.

Amitrole or Dalapon are effective.

Apply to bamboo foliage following label rates and directions. Extreme care must be taken to avoid spray drift falling on other desired grasses such as the lawn. If regrowth occurs, spray again when 40 cm high.

WEED CONTROL AROUND TREES AND ORNAMENTALS

Before using any of the following herbicides, CHECK THE LABEL directions to determine what plants they can be used on and any other precautions. These chemicals may harm some desirable plants.

HERBICIDE	REMARKS AND APPLICATION SUGGESTIONS
Eptam 2.3% granular	Apply to the soil around flowers, shrubs and trees. SEE LABEL FOR COMPLETE DIRECTIONS. Prevents weed growth. Kills some broad-leaved and most grassy weed seeds as they germinate. Not effective against established weeds.
Trifluralin 1.47% granular	Apply to the soil around flowers, trees and shrubs to prevent weed growth. SEE LABEL FOR COMPLETE DIRECTIONS. Kills some broad-leaved and grassy weed seeds as they germinate. Avoid use on soils high in organic content or very fine-textured clays. Growing weeds are not controlled.
Simazine 50% WP or Simazine 4% granular	Apply to the soil around flowers, trees and shrubs to prevent weed growth. Kills all germinating weed seeds. Growing weeds are not controlled. SEE LABEL FOR MORE COMPLETE DIRECTIONS ON USE. CAUTION—If used at high rates this herbicide will kill all vegetation.
Hand-weed, prevent flowering and seeding.	Morning Glory—a persistent weed, multiplies by seed and creeping roots.

WEED CONTROL ON DRIVEWAYS, PATHS, AND FENCE LINES

HERBICIDE	REMARKS AND APPLICATION SUGGESTIONS
Atrazine, borax and borate compounds, bromacil (Hyvar), diuron (Karmex), Simazine	Use any of these chemicals at label rates. These chemicals suppress all plant growth for long periods, depending on the type of soil, rainfall and rate of application. Since they are sterilants DO NOT APPLY TO SOIL SURFACE NEAR ORNAMENTAL PLANTS OR SHRUBS WHERE THE CHEMICAL MIGHT REACH THE ROOT ZONE OF SUCH PLANTS. Sterilants may leach down slopes especially where shallow topsoil overlays hard pan. Apply the chemical in water solution as a spray, or broadcast the granular chemical over the soil surface and water in.
Amitrole T or Amitrole 50 W	Use at label rates. Spray all weed foliage thoroughly. Regrowth of perennial plants will require repeat treatments. Application at label rates to growing weeds and grass provides non-selective control. Amitrole T or Amitrole WP may be added to the soil sterilants above to kill established growth.
2,4-D plus diesel oil (1:10 mixture)	Blackberry Carry out control operation in winter to avoid damaging neighbouring plants. Apply herbicide mixture to freshly cut stems; it will translocate down into the root system, thus killing the plant.
2,4-D	Knapweeds—diffuse and spotted. Apply to seedlings and early rosette stage. Repeat when new seedlings appear. Do not let go to seed.
2,4-D, or 2,4-D plus Mecoprop, or Amitrole T, or Amitrole 50 W	Morning Glory. A very persistent and difficult to control perennial. Multiplies by seed and creeping roots. Do not let flower or go to seed.

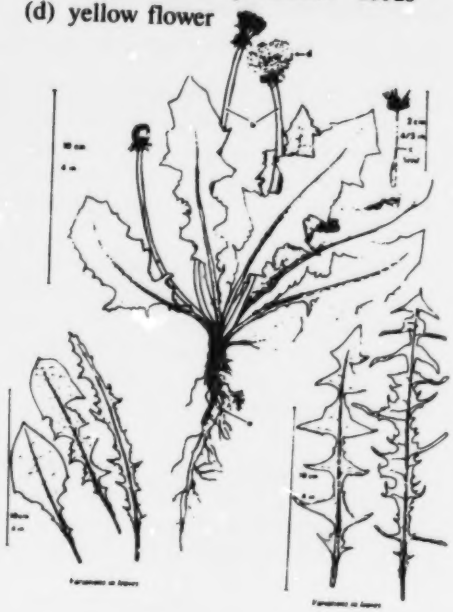
COMMON WEEDS

Creeping Buttercup

(a) horizontal stem root at nodes
(b) blades 3-part lobed and toothed distinct, short stalk
(c) seeds in green to brown round cluster, seeds shiny black
(d) 5 shiny yellow petals

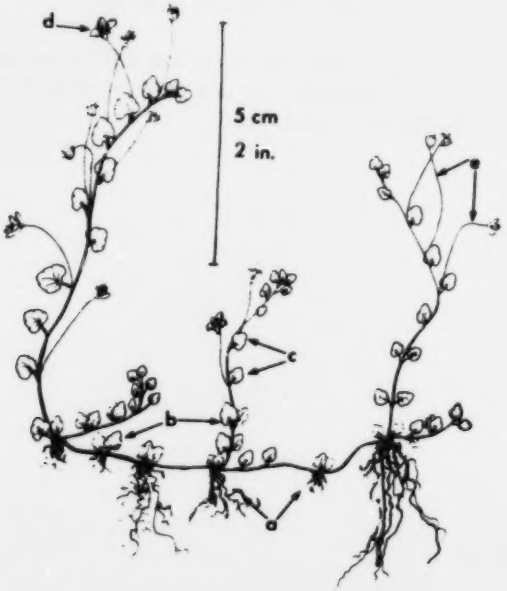
Dandelion

(a) deep, thick taproot
(b) unbranched hollow stalk
(c) long, slender "parachute" seeds
(d) yellow flower



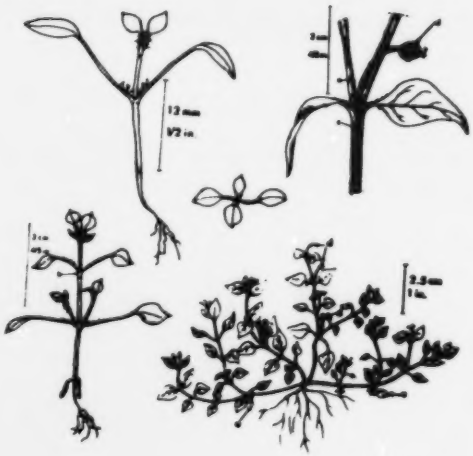
Creeping Speedwell (Veronica)

(a) stems creeping, often rooting at nodes
(b) rounded leaves 1 cm with teeth, opposite on based stem
(c) leaves alternate further up stem
(d) flowers bluish-white, four lobed, 8 mm across
(e) stalks slender, 2–3 cm long



Common Chickweed

(a) horizontal, leafy stems root at nodes
(b) stems bright green, swollen nodes
(c) lengthwise fine, white hair
(d) small white flowers
(e) green tapered leaf

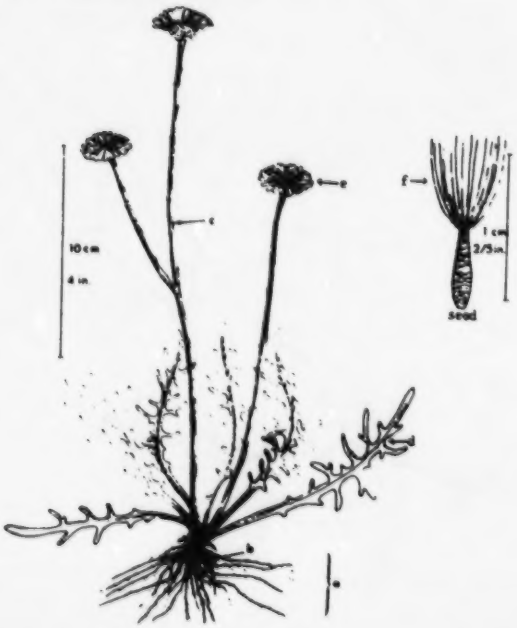


English Daisy

(a) slender, leafless stalks, 5–15 cm above base
(b) numerous ray florets white to purplish
(c) yellow disk florets
(d) oval irregularly toothed leaves

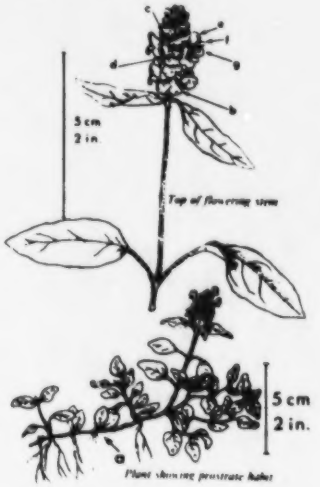
Fall or False Dandelion

(a) fibrous root system
(b) very short taproot
(c) many small scale (cats-ear) leaves
(d) hair on upper side of leaf
(e) bright yellow flowers
(f) feathery brown hair



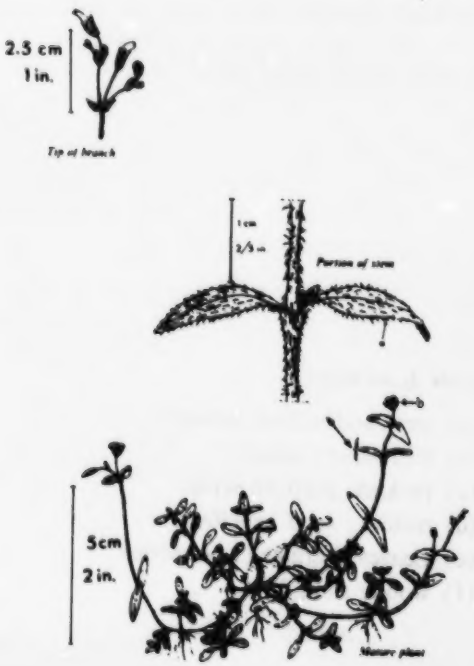
Heal-All

(a) stems 10–50 cm, rooting at nodes
(b) broad kidney-shaped bracts
(c) floret scoop-shaped upper tooth
(d) purplish lower teeth
(e) rounded and arched lower lip
(f) small side lobes
(g) larger central lobes



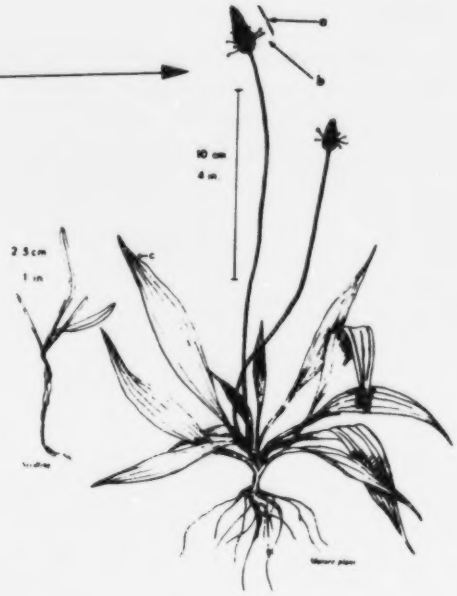
Mouse-Eared Chickweed

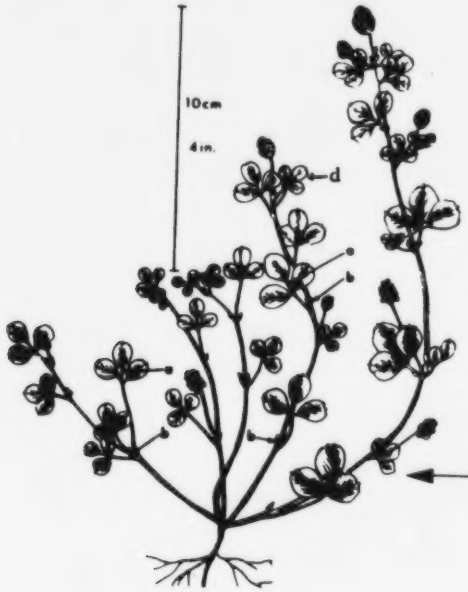
(a) opposite leaves per node covered with hair. Leaf hair 2 mm long
(b) flowers white



Narrow-Leaved Plantain

(a) oval spike of tiny green flower
(b) anthers at end of thin stamens
(c) narrow leaf, prominent ribs



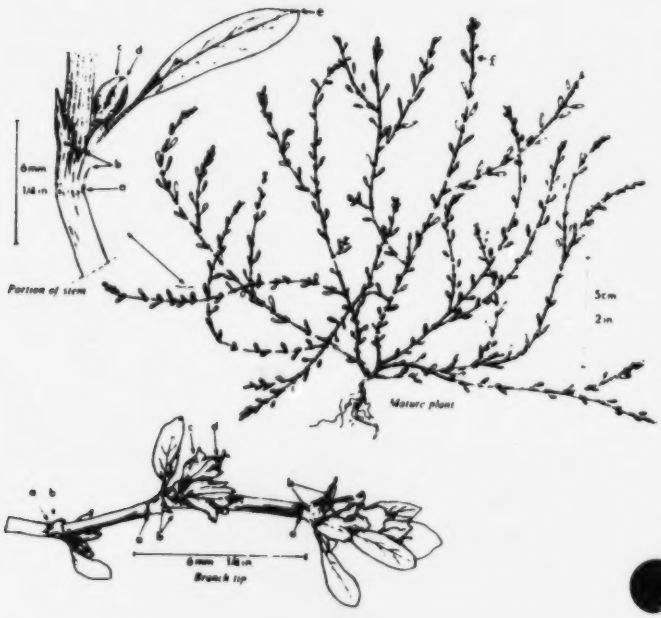


Black Medick

(a) central leaflet has definite stalk
(b) thick stipules at junction
(c) black seedpods
(d) leaves yellow

Prostrate Knotweed

(a) stem nodes thick, distinct
(b) thin papery sheath
(c) pinkish, purplish sepals
(d) mature "seed" enclosed
(e) Leaves alternate (1 per node)
(f) woody stem

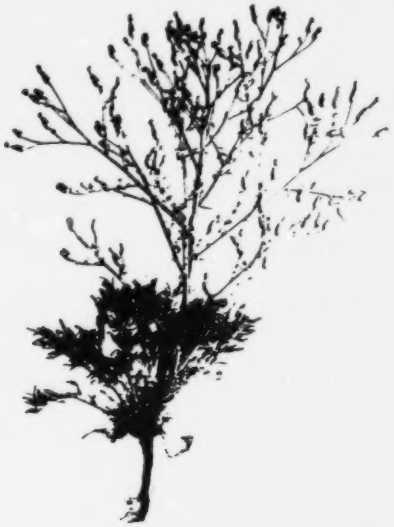


Field Bindweed, Morning Glory

(a) plant
(b) seed
(c) flower
(d) creeping root

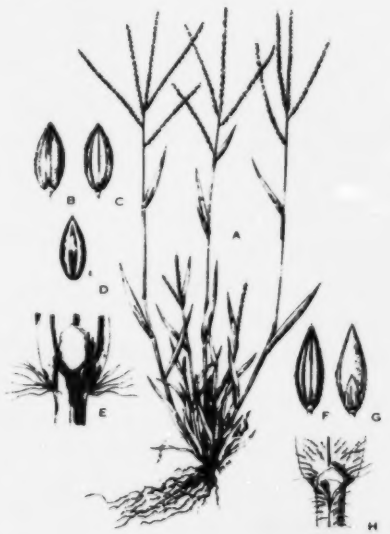
Diffuse Knapweed

(a) plants two to three feet high, branched
(b) leaves alternate, deeply divided, with rough hairs
(c) numerous small, white or purplish flower heads
(d) spiny bracts surround the flower head



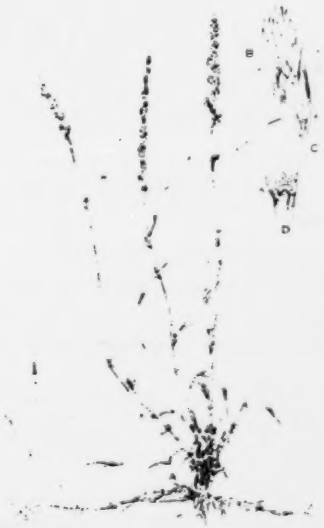
Smooth Crabgrass

(a) annual weed becoming sprawling in habit
(b) front of spikelet
(c) back of spikelet
(d) seed
(e) Spikelets arranged in two rows along the spike
(f) leaf blades smooth flat, usually .06 cm or narrower



Couchgrass (Quackgrass)

(a) creeping rootstocks, whitish or yellowish and cordlike.
(b) spikelet
(c) seed from front and side
(d) flaps (auricles) present between the leaf blade and sheath
(e) leaves hairy on the inner surface, edges rough



PESTS FOUND IN AND AROUND THE HOME

Some insects can be objectionable or annoying around the home, particularly in patio areas. They may invade the home itself, if not controlled outdoors.

DESCRIPTION	CONTROL
Ants	
These insects do not eat plants but may be attracted to food. Look for black or brown insects with narrow waists, varying in length from 3 to 19 mm. Ants are sometimes winged. They usually appear in groups, making their nests in lawns, old tree stumps and under rocks even in house walls between the sheathing and siding.	Outdoors, spray nest with: Diazinon 12.5% EC at 12 mL/L of water; or dust with Sevin 5% D according to label directions. Indoors, practise good housekeeping. Floors and cupboard should be cleaned regularly to remove food particles. Do not store ant-infested firewood in the home. Apply a proprietary household spray containing propoxur (Baygon), diazinon or malathion with a paint brush to areas where ants are seen. Pamphlets on wood-nesting or carpenter ants are available from the B.C. Ministry of Agriculture and Food. (See also carpenter ants below).
Bats	
In the spring and summer bats may take up residence in attics, walls and chimneys of buildings or other dark, hot places. They make disturbing noises, leave an unpleasant odour and can carry rabies and insect pests. Bats also provide a beneficial service by feeding on moths, beetles and mosquitoes. Prevent bats from entering the building rather than destroying them once they have entered.	Notify the Ministry of Health. Screen off all openings to building with 5 mm wide mesh. Full time illumination of the attic during May to August will discourage bats from roosting. Moth flakes or crystals will also repel bats and drive them out of the attic. Place 2-3 kg in open containers in the attic. Once the bats have left, clean the area and block off any opening. If control is still required contact a licensed pest control operator.
Bean Weevils	
Grayish weevils up to 4 mm long, emerge from infested bean seeds and stored beans used for food.	Store infested beans in moisture-proof container in deep freeze for two weeks to kill all stages of the insect, then in cool, dry place until use.
Boxelder Bug	
(Not prevalent on Lower Mainland) This pest invades homes in the fall with the advent of cooler weather. Look for red and black, winged insects about 12 mm long.	Outdoors, spray with: Diazinon 12.5% EC at 6 mL/L of water; or Malathion 50% EC at 2 mL/L of water. Indoors, vacuum regularly and thoroughly.

See Table of Pesticides Trade Names Page 107.

DESCRIPTION

CONTROL

Carpenter Ants

These are the largest species of ants in B.C., up to 15 mm long, black in colour. Winged individuals occur in February. The wings are not longer than the body and have only a few veins. The ants live in colonies. If they are present in the wood of a home, sawdust may be noticed.

Spot treatment with a residual insecticide such as Baygon is of some help. However, to get to the source of the problem, insecticide must be deposited inside walls where the ants nest and travel. This is most satisfactorily done by a licensed pest control company.

Carpenter ant

Carpet Beetles

Carpet beetles are oval, about 3 mm long, and mainly grayish to black. Some are mottled with irregular patterns of white and red-to-yellow scales on the dark background. The larvae are oval or carrot-shaped, and about 5 to 13 mm long. They are covered with dark-brown or black hair.

The species known generally as the common carpet beetle is abundant in the interior of British Columbia.

The varied carpet beetle is abundant only in coastal areas of British Columbia. White, yellowish, and brownish scales on the adult form irregular bands across the back. The larva has alternate bands of light and dark brown, and three pairs of tufts on the tip of the abdomen.

Regularly vacuum rugs and carpets, upholstered furniture, cold-air ducts, cracks in flooring, and other undisturbed areas, especially under heavy furniture and appliances.

Dry-clean woolen clothes and store them in a moth-proof container with a piece of Vapona strip.

Spray infested areas with a residual insecticide containing Baygon and Malathion.

In the fall of the year, remove all nests of birds and wasps. Carpet beetles can multiply by feeding on hair and feathers and insect remains, and then invade the home through cracks and crevices.

Larva

Carpet beetle

Centipedes and Millepedes

They may migrate into homes in spring and fall, but they do no damage in homes.

See page 26 for description and control.

See Table of Pesticides Trade Names Page 107.

DESCRIPTION	CONTROL
Fleas	
Small 1 mm long, dark brown jumping insects. Usually associated with dogs, cats or chickens. May bite people if host animals are not available.	On pets, use a flea collar, flea powder and a shampoo containing an ingredient against fleas. Safer's Insecticidal Flea Soap for dogs can be used to bathe your pet. In the pet's box or sleeping basket, use a flea powder or used disposable boxes and bedding, replacing them every month. These areas can be cleaned with Safer's Insecticidal Flea Soap. In the home, use a domestic insecticide containing Baygon and Malathion. Pets become reinfested after roaming in areas frequented by other flea-ridden animals. Repeat treatment as often as necessary.
 Flea	
House Flies	
Flies are attracted to food odours. They may spread disease on food. The pests develop in manure and rotting vegetation or meat.	To prevent flies from entering the house, use tight-fitting screens on windows and doors—especially around food-preparing and eating areas. Also screen crawl space and attic ventilators. Seal any cracks around window frames. For temporary relief indoors, use aerosol sprays containing allethrin or pyrethrin. Sticky fly traps and swatters are also effective. Animal manures, garbage and composts should be disposed of or covered to prevent their being used as breeding sites. If breeding sites are discovered, spray with: Malathion 50% EC at 21 mL/L of water.
Food-Infesting Beetles	
Larder beetles, red and confused flour beetles, and merchant grain beetles are the most common pests found in cereal products. They range in size from 8 mm to 3 mm respectively. Both larval and adult stages may be found in kitchen cupboards infesting cereal products. The larvae are up to 8 mm long when fully grown.	Dispose of infested food. Store all food in tightly sealed containers. Thoroughly vacuum clean infested space. Remove birds nests and wasps' nests from attic at end of season. Larder beetles can breed in nests, feeding on insect remains, feathers and hair of such nests. If an insecticide must be used apply 0.5% propoxur aerosol spray to non-food areas (eg. behind appliances, under sink). Remove all contents of infested cupboards before applying a contact household insecticide containing synergized pyrethrins to interior surfaces paying particular attention to cracks and crevices. Follow label directions.
 Larder beetle *Merchant grain beetle*	

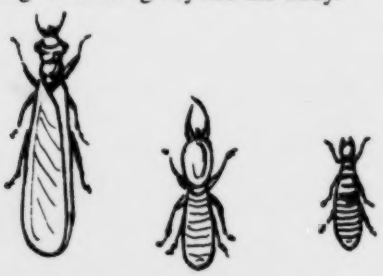
DESCRIPTION	CONTROL
Mosquitoes	
Mosquitoes are biting and blood-sucking insects. They develop from wrigglers in stagnant water, and may fly many miles to annoy animals and humans.	Use of commercially available aerosol foggers may provide some short-lived, local relief. Effective control requires a large-scale abatement program. Personal relief may be obtained by using repellents and screens.
Rats and Mice	
Rats and mice are not normally seen, unless they are very numerous. Their presence can be detected by tell-tale signs: -the presence of their droppings—firm, rod-shaped, slightly curved masses with round ends, 5 mm-20 mm long; -the sounds they make; -their tracks on dusty surfaces; -evidence of their burrows or holes.	The most important control is to remove nesting sites and sources of food and water. After this has been done, rats and mice can be trapped or poisoned. Use cheese or cake on mouse traps, and peanut butter or meat on rat traps. To prevent re-entry, buildings should be rodent-proofed by installing concrete floors and footings, tight fitting doors and windows, and wire screens over basement windows and vents. Cats will help keep populations down, but will not eliminate them. Most cats are afraid to tackle a full grown rat.
Silverfish	
These insects are often found in the bathtub, where they have fallen in and cannot climb back out again. They do not get into the bathtub through the drain pipe. Look for slender, wingless, silver-grey insects, about 12 mm long when mature. They are very quick moving. Silverfish are active at night and in dark places.	Use a one percent solution of diazinon or propoxur where silverfish are seen. It is also advisable to treat areas around baseboards and heat-duct outlets. When insecticides cannot be used, coat one side of strips of stiff paper with liquid honey, and lay them in places where silverfish have been seen. Silverfish will become stuck to the strips when walking over them.

Silverfish

See Table of Pesticides Trade Names Page 107.

DESCRIPTION	CONTROL
Skunks	
Black mammals with white stripes down the back. Up to 30 cm long. They occasionally seek refuge in crawlspace of houses where they give off an offensive odour.	To prevent skunks from getting into crawlspace, screen vents with 6 mm or finer metal screen. If a skunk gets into crawlspace, place 1 kg of moth balls or flakes on a tray in crawlspace which may cause the skunk to move out. Screen vents and remove moth balls. If repellent fails to expel the skunk, live-trap it in a "Havahart" or "Tender Trap" baited with fish, chicken, or egg. To dispose of a trapped skunk contact the SPCA where available, or take the trapped animal to an unpopulated area and let it go.
Sowbugs	
See page 26 for description and control.	
Spiders	
The webs and appearance of these insect predators are disturbing to some people. Most spiders are beneficial to humans. The black widow spider is harmful. The black widow is a large spider, measuring 3.8 cm with legs extended. It is shiny black with two reddish triangles on the underside of its abdomen which form the shape of an hourglass.	Sweep away webbing and treat the area with a pressurized spray containing propoxur. If webbing reappears, repeat this treatment. To treat larger areas apply: Malathion 50% EC at 37 mL/L of water; Both these treatments will control the harmful black widow spider. For more information on the black widow, contact the B.C. Ministry of Agriculture and Food.
Termites	
The main termite of concern to home owners is Pacific Dampwood Termite. It is a problem in homes and other wood structures that have permanently moist wood due to leaks or improper foundations that are not high enough (25 cm) above ground level. Winged termites are present in July and August and are creamy or light brown, 12 mm long, with net-veined wings extending beyond the body.	Chemical control is seldom successful. The most satisfactory solution is to eliminate leaks or raise the building and put a proper foundation under it. Buildings sitting on wood posts or blocks can be saved from termite damage by using posts or blocks soaked in creosote or pentachlorophenol. Termites will not attack wood treated in this manner.

Black widow spider



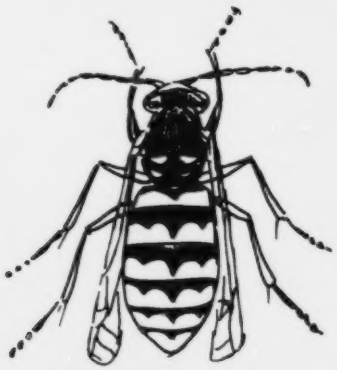
Termites

DESCRIPTION

Wasps, Hornets, and Yellowjackets

These beneficial insects usually prey on other insects, but are sometimes attracted to food where their flying and ability to sting may be annoying.

These insects usually nest in grey, paper-like globes located in trees or under house eaves. Some species nest in walls of houses, in attics, on branches of evergreens, or in the soil.



Yellowjacket wasp

CONTROL

Where they are a nuisance, destroy nests in early summer, before insect numbers have built up. Treat after dark when insects are not active.

Use a pressurized spray containing propoxur, or treat nest entrances with:

Methoxychlor 5% D;

or Rotenone 1% D according to label directions;

or Sevin 5% D.

Where nests cannot be located, commercial wasp traps may be helpful if used early in the season.

Ground nesting wasps can be killed by pouring lots of boiling hot water into the nest entrance. (If possible, use a garden hose). This is most safely done late in the evening after dark.

BENEFICIAL INSECTS

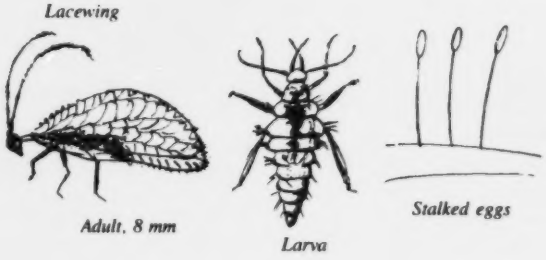
Beneficial insects belong to three categories: predators, parasites, and pollinators.

Predators are those which prey on and eat other insects (pests, or weeds). Examples are ladybird beetles and their larvae, lacewing larvae, yellowjacket wasps, syrphid fly larvae, and ground beetles and their larvae. Spiders and predatory mites are also beneficial, though they are not grouped with the insects. Spiders feed almost entirely on insects, and predatory mites feed on other, usually harmful, mites.

Parasites are those that live on or in another insect (or weed) debilitating and/or finally killing it. Parasites are usually small or very small. There are egg parasites, larval parasites, and some that parasitize adult stages of insects. Some well-known ones are aphid parasites and whitefly parasites. Both are tiny wasps. Another common parasite is a tachinid fly. It lays one or more eggs on a caterpillar. The eggs hatch and the maggots bore into the caterpillar. The caterpillar may die or develop into a pupa. In either case, tachinid flies will emerge from the caterpillar or from the pupa, ready to parasitize again, while the butterfly will not live to reproduce itself.

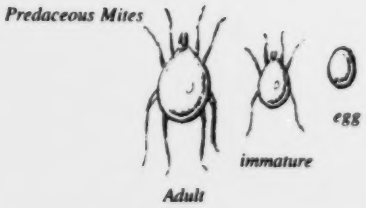
Pollinators are those which pollinate many of our berry and fruit crops, as well as many seed crops. Examples are honey bees, leafcutter bees, other bees, some flies, butterflies, moths, and other insects that visit flowers to feed on nectar and pollen.

Parasitized Aphids, (2-3 mm), exit holes in their body walls where parasitic wasps emerged.



Syrphid Larva (7 mm) feeding on aphid (2 mm)

Caterpillar (6 cm) with tachinid parasite's egg (0.5 mm) on its back.



TRADE NAMES AND ACTIVE INGREDIENTS OF INSECTICIDES, FUNGICIDES, AND INSECTICIDE-FUNGICIDE MIXTURES REGISTERED FOR HOME GARDEN USE

Trade Name	Insecticide												Fungicide					
	diazinon	dichlorvos	dicofol	metaldehyde	methoxychlor	oxydemeton-methyl	potassium oleate	propoxur	pyrethrin	trichlorfon	benomyl	captan	dodine	ferbam	folpet	sulphur	thiophanate-methyl	zineb
African Violet Emulsion Miticde			X															
Atox Vegetable Dust																		
Benomyl Systemic 50 WP											X							
Captan 50 WP												X						
Chipman Benomyl-Captan Systemic											X	X						
Chipman Rose Dust														X				
Chipman Insecticide Strip		X																
Chipman Liquid Ant Killer																		
Chipman Organic Liquid Biological																		
Chipman Rapid Aphid Killer Aerosol																		
Chipman Rose Dust														X				
Chipman Soil and Bulb Dust												X						
Chipman Wasp and Hornet Killer							X											
Cygon 2E																		
Deecop Potato, Tomato and Vegetable Dust																		
Deecop Potato, Tomato and Vegetable Liquid																		
Dutox						X												
Diazinon Granular	X																	
Diazinon Spray	X																	
Dipel																		
Floritect Rose and Flower Spray														X				
Foligard Lawn and Garden Fungicide																		
Formisol Ant and Crawling Insect Killer	X						X											
Formi-Trap Ant Traps																		
Fruit-Plus Liquid													X					

TRADE NAMES AND ACTIVE INGREDIENTS OF INSECTICIDES, FUNGICIDES, AND INSECTICIDE-FUNGICIDE MIXTURES REGISTERED FOR HOME GARDEN USE—*Continued*

Trade Name	Insecticide												Fungicide							
	diazinon	dichlorvos	dicofol	metaldehyde	methoxychlor	oxydemeton-methyl	potassium oleate	propoxur	pyrethrin	trichlorfon	benomyl	captan	dodine	ferbam	folpet	sulphur	thiophanate-methyl	zineb
Fruit-Spray Concentrate												X						
Green Cross Ant, Roach and Spider Blaster							X											
Green Cross Bug Killer							X											
Green Cross Creepy Crawly Pressurized								X										
Green Cross Fly Blaster												X						
Green Cross Fruit Tree and Garden Spray							X											
Green Cross Garden Guard																		
Green Cross Hornet and Wasp Blaster							X											
Green Cross 4 Month Insect Strip		X																
Green Cross House and Garden Blaster								X										
Green Cross Household Spray							X											
Green Cross Houseplant Insecticide								X										
Green Cross Liquid Ant Killer																		
Green Cross Multi-Purpose Dust				X								X				X		
Green Cross Potato Dust																	X	
Green Cross Rose Dust												X				X		
Green Cross Rose and Flower Guard								X										
Green Cross Slug Destroyer Pellets				X														
Green Cross Soil and Bulb Dust												X						
Green Cross Tat and Ant Traps																		
Green Cross Tomato and Potato Dust																		
Green Cross Yard and Patio Fogger								X										
Kerigard Soil Dust	X																	
Kerigard Houseplant Insecticide								X										
Later's Lagon 280 E																		
Larvex Maggot Killer Granules	X																	
Later's Aerosol Indoor Plant Spray								X										
Later's Ant, Roach and Spider Killer							X											
Later's Bug-etta Slug & Snail Killer				X														
Later's Bulb Dust												X						
Later's Copper Spray																		
Later's Crawling Insect Killer							X											

TRADE NAMES AND ACTIVE INGREDIENTS OF INSECTICIDES, FUNGICIDES, AND INSECTICIDE-FUNGICIDE MIXTURES REGISTERED FOR HOME GARDEN USE—*Continued*

Trade Name	Insecticide													Fungicide					
	diazinon	dichlorvos	dicofol	metaldehyde	methoxychlor	oxydemeton-methyl	potassium oleate	propoxur	pyrethrin	trichlorfon	benomyl	captan	dodine	ferbam	folpet	sulphur	thiophanate-methyl	zineb
Later's Diazinon Pressurized Spray	X																	
Later's Phaltan																		
Later's Tropical Soil Insecticide Dust	X														X			
Later's Garden Sulphur Fungicide																		
Later's Isotox Systemic Insect Killer			X			X										X		
Later's Hornet and Wasp Bomb							X											
Later's Liquid Ant Killer																		
Later's Liquid Slug and Snail Killer				X														
Later's 4% Malathion Dust																		
Later's Mite Killer Kelthane E.C.			X															
Later's Onion Maggot Granules																		
Later's Potato and Tomato Dust											X							
Later's Rose & Floral Dust				X												X	X	
Later's Pressurized Insect Killer								X										
Later's Pyrethrin Insecticide Dust								X										
Later's Sevin 40% Liquid Insecticide																		
Later's Residual Crawling Insect Spray							X											
Later's 5% Sevin Dust																		
Later's Weevil and Earwig Bait																		
Later's Tomato & Veg Insect Killer RTU								X										
Later's Rose & Flower Insect Killer RTU								X										
Limax Slug Killer Pellets				X														
Malathion 50 EC																		
Methoxychlor 25 EC				X														
Methoxychlor 50 WP				X														
Methoxychlor 10% D				X														
Nox-All Ant Doom Powder								X										
Nox-All Ant Trap																		
Nox-All Earwig Bait Bran																		

TRADE NAMES AND ACTIVE INGREDIENTS OF INSECTICIDES, FUNGICIDES, AND INSECTICIDE-FUNGICIDE MIXTURES REGISTERED FOR HOME GARDEN USE—*Continued*

Trade Name	Insecticide												Fungicide					
	diazinon	dichlorvos	dicofol	metaldehyde	methoxychlor	oxydemeton-methyl	potassium oleate	propoxur	pyrethrin	trichlorfon	benomyl	captan	dodine	ferbam	folpet	sulphur	thiophanate-methyl	zineb
Raid Ant and Roach Killer							X											
Raid Rose and Flower Spray							X	X						X				
Ridsect House and Garden Spray				X				X										
Rotenone 1% D																		
Safer's Insecticide Soap																		
Sevin 50 WP																		
Sevin Spray																		
Sys-Tem 2E																		
Wilson's Fruit Tree Spray												X						
Wilson's Vegetable Fungicide																		
Wilson's Rose and Flower Spray								X						X				
Wilson's Slug Bait Pellets				X														
Wilson's Tomato and Vegetable Dust												X						
Wilson's Tree and Shrub Spray			X		X													
Wilson's Antex																		
Wilson's Ant and Roach Spray							X											
Wilson's Ant Trap																		
Wilson's Bug Killer Dust												X						
Wilson's Bulb and Soil Dust																		
Wilson's Cutworm and Sowbug Bait																		
Wilson's 1% Diazinon	X																	
Wilson's Handy Household Insect Spray								X										
Wilson's Houseplant Insect Killer								X										
Wilson's Jet for House and Garden								X					X					
Wilson's Liquid Fruit Tree Spray																		
Wilson's Liquid Garden Spray			X	X														
Wilson's Maggotox	X																	
Wilson's Potted Plant Insect Spray								X										
Wilson's Potted Plant Soil Insecticide	X																	
Wilson's Rotenone Spray																		
Wilson's Wasp and Hornet Spray							X											

HERBICIDES AND HERBICIDE MIXTURES AVAILABLE FOR HOME AND GARDEN USE

Trade Name	Herbicide											
	bensulide	borates	bromacil	dicamba	ferrous sulphate	MCPA	sodium metaborate	trifluralin	2,4-D			
Chipman Crabgrass Preventer	X											
Chipman Dalapon Quack Grass Killer												
Chipman Dandelion Killer									X			
Chipman Lawn Weedkiller "k"				X					X			
Chipman Premium Lawn Weedkiller									X			
Co-op Weed Stop Granular								X				
Green Cross Granular Vegetation Killer							X					
Green Cross Hoe-No-More												
Green Cross Killex				X					X			
Green Cross Poison Ivy Killer				X					X			
Green Cross Weedex Dandelion Bar									X			
Green Cross Weed 'N Feed				X					X			
Green Cross Weed-No-More									X			
Later's Calcide Vegetation Killer												
Later's Dandelion Weedkiller									X			
Later's Grass Killer												
Later's Hybor-D Soil Sterilent		X	X						X			
Later's M.C.P.A. Amine 400					X							
Later's Mecoprop Weed Killer												
Later's Weed-B-Gon Lawn Weed Killer									X			
No-Hoe Granular Weed Preventer												
Steril Granular Vegetation Killer							X					
Steril Liquid Vegetation Killer												
Wilson's Dandelion Killer									X			
Wilson's Garden Weed Preventer												
Wilson's Multi-Weeder				X					X			
Wilson's Poison Ivy and Brush Killer												
Wilson's Stop Weed									X			
Wilson's Stop Weeds												

PESTICIDE TRADE NAMES AND THEIR COMMON NAMES

INSECTICIDES and MITICIDES

Trade Name	Common Name
Allethrin, Raid	pyrethrins
Baygon	propoxur
Cygon, Rogor	dimethoate
Diazinon, Spectracide, Basudin	diazinon
Dursban	chlorpyrifos
Imidan	phosmet
Kelthane	dicofol
Kepone	chlordecone
Malathion	malathion
Metasystox-R	oxydemeton-methyl
Methoxychlor, Marlate	methoxychlor
Oil (dormant)	dormant oil
Orthene	acephate
Phosalone	phosalone
Pirimor	pirimicarb
Pyrethrum, Raid	pyrethrin
Rotenone, Derris	rotenone
Safer's Insecticidal Soaps	potassium oleate
Sevin	carbaryl
Thuricide	*Bacillus thurengiensis*
Vapona	dichlorvos
Weevil Bait	sodium fluosilicate

HERBICIDES

Amino triazole, ATa	amitrole
Atrazine (AAtrex)	atrazine
Banvel-D	dicamba
Borax	borax
Casoron	dichlobenil
Certrol, Actril, Totril	ioxynil
Chloramben	chloramben
Dacthal	chlorothal
Dowpon, Basfapon, Dalapon	dalapon
Eptam	EPTC
Hyvar	bromacil
Karmex	diuron
MCPA	MCPA amine
Mecoprop, Compitox	mecoprop
Moss Killer	ferrous ammonium compounds
Reglone	diquat
Simazine, Princep, Simadex	simazine
Telvar	monuron
2, 4-D	2, 4-D
Treflan	trifluralin

FUNGICIDES

Trade Name	Common Name
Benlate, Benomyl	benomyl
Captan, Orthocide	captan
Copper Spray, Coprantol, Copper Oxychloride, Tricop	fixed copper
Cyprex	dodine
Daconil	chlorothalonil
Dithane M-45	mancozeb
Dithane Z-78	zineb
Easout	thiophanate methyl
Fermate	ferbam
Karathane	dinocap
Lime-sulphur	lime-sulphur
Manzate D, Dithane M-22	maneb
Phaltan	folpet
Phygon	dichlone
Sulphur	sulphur
Zerlate	ziram
Zineb, Dithane Z-78	zineb

MOLLUSCICIDES

(Slug & Snail Poisons)

Mesurol, Trump	methiocarb
Metaldehyde, Slug Destroyer, Liquid Slug & Snail Killer, Corys	metaldehyde

RODENTICIDES

(Mouse & Rat Poisons)

Chipman's, Green Cross, Later's, Wilson's Rat & Mouse Bait	As singles or combinations of: Chlorophacinone and/or warfarin, and/or sulfaquinoxaline, and/or calciferol, or bromadiolone, and/or prolin.

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MINIMUM NUMBER OF DAYS BETWEEN LAST PESTICIDE APPLICATION AND HARVEST

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	cygon	diazinon	ethion	imidan	kelthane	malathion	metaldehyde*	methoxychlor	pyrethrum	rotenone	sevin	sodium fluosilicate	spray oil	thuricide	benomyl	captan***	chlorothalonil	cypren	difolatan	ferbam	fermate	fixed copper	lime sulphur	sulphur	thiophanate methyl	thiram**	zerlate
Apples	14	14		7	7	3	A	7			7		D		1	7		7		1	7	1	D	1	1		1	
Apricots		10			14	7	A	21			3		D		1	7				21	E	D				F	
Asparagus						3	A	3		1	1					C									C		
Beans	7	14				3	A	7	1	1	7				14	C				14		1		1	14	C		
Beets	3	14				7	A	7		1	14					C					1					C		
Blackberries		B			7	7	A			1	7	A			0	7				A		D						
Blueberries		B				3	A				1	A				7				40								
Broccoli	4	5				3	A	14	1	1	3			1		C	7				1					C		
Brussels sprouts	21	14				7	A	14	1	1	3			1		C	7									C		
Cabbage	4	7				7	A	3	1		3			1		C	7				1					C		
Carrots		10				7	A	7			7					7	1				1					C		
Cauliflower	4	5				7	A	7	1	1	3			1		C	7				1					C		
Cherries	15	10			7	3	A	7			3		D		1	7		7		0	4	D		1	1			
Corn		B				5	A			1	14					C										C		
Cucumbers		7				3	A	1	1	1	3				0	7	1				1	1				C	1	
Currants		B				3	A	14		1												1	D	1				
Gooseberries		B				3	A	14		1												1	D	1				
Grapes		16			7	3	A			1	3	A			7	7					7	1		1				
Lettuce	3	10				14	A	14		1	14			1		C					1					C		
Onions		10	C			3	A	7		1						C						1				C		
Pears	14	14		7	7	3	A	7			7		D			7		7			7	1	D					
Peas	3					3	A	7			3					C								1				
Peaches		20			14	7	A	21			1		D		1	7		F	E	0	21	E	D	0	1		F	
Plums		10			28	3	A	7			1		D		1	7							D	0	10	D		
Potatoes	7	14				3	A	7		1	7			1		7	7			C		1			C			
Prunes		10			28	3	A	7			1		D		1	7				10			D	0	10			
Radishes		10				7	A	7		1	7																	
Raspberries		B			7	3	A			1	7	A			1	7				1	A		D		1			
Spinach	7	10				7	A	14		1	14			1		C						1				C		
Strawberries		5			7	3	A	14		1	1	A			1	7		7		1			D	1	1			
Tomatoes	7	3				3	A	1		1	1			1	0	7	1				1	1				C	1	
Turnips	3	14				7	A	7		1	14			1												C		

A—Do not apply to edible parts of plants.

B—Do not apply after blooming.

C—Use only at planting or seeding.

D—Apply as a dormant spray.

E—Apply after harvest.

F—Do not apply after husk fall.

* Do not use metaldehyde on edible parts of plants

** Do not consume alcoholic beverages within 24 hours of using thiram.

*** The use of captan in home gardens is under review. New labels will carry up to date recommendations. When using old packages follow label recommendations but increase the number of days between last application and harvest to 7 days for all crops.

Blank spaces indicate that the pesticide is not registered on the crop, or is not recommended on the crop in B.C., or is not available in home garden packages.

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